THE EDDY-LEA ENERGY ALLIANCE, LLC
GLOBAL NUCLEAR ENERGY PARTNERSHIP
Award Number: DE-FG07-07ID14799
City of Las Cruces Public Participation Meeting & Round Table Discussion
New Mexico State University
April 4, 2006
3:00p.m

Las Cruces, Dona Ana County, New Mexico, was the site of the fourth Public Meeting and a Round Table discussion held by the Eddy-Lea County Energy Alliance (ELEA) in order to solicit professional opinion, technical information, and to foster collaboration with the universities, colleges, and academic institutions throughout Southern and South Eastern New Mexico regarding the Global Nuclear Energy Partnership (GNEP) proposal and the ELEA-proposed site. In addition, the public meeting and roundtable discussion provided information regarding the economic, workforce, and academic readiness issues involved with the GNEP as well as identified local stakeholders and public concerns, issues, and values related to the project and siting.

Public Notice and Public Outreach

The public meeting and round table discussion was held at New Mexico State University (NMSU) in the Clinton P. Anderson Physical Science Center. The emphasis for the meeting and roundtable discussion was on academic collaboration, work force development, and business involvement. Academic outreach included discussions with Dr. Michael Martin, President of NMSU; Dr. Dan Lopez, President of New Mexico Tech; and Dr. Ed Askew, Associate Director of the Carlsbad Environmental Monitoring and Research Center (CEMRC) to assess who should participate in the roundtable discussion on behalf of their respective academic institutions. Dr. Martin and Dr. Lopez were not able to personally attend but were enthusiastic about the GNEP proposal and were eager for their respective academic institutions to participate. They requested additional information and ongoing communication about the status of the GNEP and the ELEA site. The Eddy Economic Development Center LLC and Carlsbad Development Center were invited to discuss business involvement. The United Association of Plumbers and Steam Fitters was invited to discuss workforce development. Representatives from the ELEA, Washington Group International (WGI), and AREVA were also requested to attend and participate.

Public notice of the ELEA public meeting appeared in the *Las Cruces Sun News* on March 31, April 1, and April 3, 2007 *(Attachment A. Affidavits of Public Notice)*

The Public Participation Meeting & Round Table Discussion

The Las Cruces meeting was specifically directed toward including academic institutions, elected officials, representatives of various workforce organizations, and business leaders. Transcription services and a Spanish translator were present. There were 27 individuals in attendance, 14 of who signed in and provided contact information *(Attachment B. Sign In Sheets)*. The agenda for the Las Cruces meeting included a welcome and historical perspective of the ELEA, the Corporate Partnership with WGI and AREVA, the GNEP Overview, Development of the Energy Corridor, and University Research and Funding Opportunities *(Attachment C. ELEA Agenda)*.

The Public Meeting and Roundtable discussion was opened by Ms. Marla Shoats of Shoats and Weaks, the communication group for ELEA, who summarized the agenda, welcomed and recognized the roundtable panelists, and asked each to introduce themselves and to identify whom they were representing. She then explained the format for the meeting. The members present at the Roundtable were:

- Dean Steven Castillo, NMSU College of Engineering
- Dr. Ed Askew, CEMRC
- John Heaton, New Mexico Legislator and ELEA Board Alternate
- Anthony Burris, NMSU Physical Science Lab
- Jerry Vaughn, United Association of Plumbers and Steam Fitters
- Dr. Mark Turnbough, Principal Site Investigator, ELEA
- Fredric Bailly, AREVA
- Bob Kehrman,WGI
- Dan Weaks, Shoats and Weaks, ELEA

Ms. Shoats indicated that public input and involvement was an integral part of the GNEP site and project selection process. She gave an overview of the three previous Public Participation Meetings that had been held in Lovington, Hobbs, and Carlsbad in addition to the Department of Energy's (DOE's) project scoping meetings that were held earlier in Hobbs, Carlsbad, Roswell, and Los Alamos. Ms. Shoats noted that the purpose of this meeting was to provide the participating academic institutions information about the technical, scientific, and infrastructure realities of the GNEP project. Additionally, it would serve as a forum to discuss academic readiness and workforce development relative to the needs of the project and the opportunities it would bring to the region and the state. Ms. Shoats indicated that participants were encouraged to pose any questions as the presentations were made and that comment did not have to wait until the end of the meeting so that there would be an opportunity for in-depth conversation on the various aspects of the GNEP as presented.

Introduction of the Eddy Lea Energy Alliance and the GNEP

Ms. Shoats then turned the floor over to Representative John Heaton to discuss the Eddy-Lea Energy Alliance LLC and the proposed ELEA site. Representative Heaton introduced himself and noted that he was an elected state representative from Carlsbad and was in his 11th year as a representative. He said the communities of Hobbs and Carlsbad were extremely enthusiastic about GNEP. He explained that both communities were unique and that both had experience with large projects involving nuclear energy – WIPP for 30 years and LES more recently. Representative Heaton said the communities had the same reservations and curiosities that people anywhere would have when nuclear facilities are considered for location in their area. Concerns included transportation, health and safety, and the economic impact on the community.

Representative Heaton said that the communities in the area went through a very intensive education process over five or six years and as a result of that education and knowledge they became proponents of the WIPP project. He also praised the DOE for continually providing information, holding numerous public meetings, and being open about the regulatory process and safety issues. The DOE continues to provide information and be receptive and responsive to community concerns and education. WIPP has provided the host community and the world with an excellent example of how a nuclear facility can go through the siting, permitting, and

opening processes, as well as the on-going operational management, all with the overarching issue of safety at the forefront.

Representative Heaton also referred to CEMRC, the center that was established to conduct baseline and on-going environmental health studies relative to the WIPP and the surrounding communities. He stated that the WIPP might be the only DOE site that deals with nuclear material that has a resource equivalent to CEMRC. NMSU has played a major role in that development. The WIPP has had independent oversight through an academic institution and that is a great asset insofar as the ELEA site is concerned.

Representative Heaton then turned to a discussion of the necessity of moving toward re-energizing the nuclear power industry in this country and the world, coupled with new technology allowing for greater reprocessing capabilities and a reduction in waste storage requirements by citing growth trends, consumption, environmental concerns, and alternative energy options. He also described some of the successful clean-up projects such as Rocky Flats and the progress at Hanford, and applauded the new RH permit for WIPP. He then summarized the basic attributes of the ELEA site and indicated that it should be considered as a serious alternative for the DOE. He further emphasized many of the outstanding characteristics of the ELEA site *(Attachment D. ELEA slides)*.

Representative Heaton then turned the floor over to Ms. Shoats who reiterated the strengths of the ELEA and the strong corporate partnership and community support.

The Corporate Partnership

Ms. Shoats then recognized Mr. Bob Kehrman to present WGI's involvement in the ELEA/GNEP site. Mr. Kehrman is stationed in Carlsbad and works at the WIPP on behalf of WGI. Mr. Kehrman presented a corporate history of WGI and its evolution into the global corporation it is today, explaining the various corporate activities and structure of WGI particularly as they relate to energy projects and the WIPP. WGI's local involvement includes Rust Constructors in Eunice, New Mexico, the site of the National Enrichment Facility, and Washington TRU-Solutions, which is the management and operations contractor for the WIPP, as well as the Engineered Products Division that builds shipping containers for hazardous and nuclear waste.

Mr. Kehrman explained that the role WGI has in the GNEP grant includes management support and participation in the site characterization studies. The site study work is being done in partnership with AREVA and Gordon Environmental, Inc. WGI, its affiliates, and its partners have a great deal of experience in the area due to the fact that they were responsible for establishing the environmental monitoring program at the WIPP. Mr. Kehrman introduced three of his staff members, Stuart Jones, Art Chavez, and Miriam Watley. These individuals, as Mr. Kehrman noted, are all locally educated at NMSU and the College of the Southwest. He indicated that it was WGI's policy to hire locally whenever possible and that WGI will be actively recruiting from local universities and colleges.

Mr. Kehrman concluded by stating that it was an honor to be chosen as corporate partners with the Alliance and recounted Carlsbad's Mayor Forrest reference to the partnership as the "dream team". Mr. Kehrman stated that the work was progressing well and that the site was absolutely everything GNEP would require. Mr. Kehrman then turned the floor back to Ms. Shoats who introduced Mr. Medford, the representative from AREVA.

Mr. Medford expressed his excitement about being involved with ELEA and the partners on the GNEP project. Mr. Medford gave a

presentation on the background of AREVA. AREVA is a French company and is a world leader in nuclear energy that is vertically integrated from uranium mining to reactors to waste reprocessing. AREVA has about 6,000 employees in the United States and 60,000 worldwide. AREVA's interest in GNEP is due to the fact that the proposed recycling facility and the fast reactor really are right in the company's core competency. Mr. Medford noted that AREVA has been reprocessing fuel since 1976 in France. AREVA supplies fuel to over 70 plants worldwide. AREVA's research and development budget is approximately $750 million, much of which is directed toward GNEP-type projects. Mr. Medford pointed out that AREVA was working with "gen three-plus" reactors, which will be the next wave of reactors in the U.S.

Mr. Medford explained the three business units of AREVA: the front-end division, which includes mining, chemistry, and fuel enrichment; the reactors and services division, which includes plants; and the back-end division that does waste treatment, spent fuel management, reprocessing and recycling. AREVA's presence in the U.S at this time includes support for commercial utilities, support to the DOE complex, two fuel fabrication facilities, and various component and mechanical operations. In addition, AREVA is involved in licensing and eventual U.S deployment of a new reactor design, the European pressurized water reactor (EPR).

Mr. Medford stated that AREVA was involved locally with the LES uranium enrichment project and provided assistance with siting, licensing, and environmental reports, as well as design activities for the facility. This involvement segues into the GNEP activities including parts of the site report; regulatory plan, and environmental activities, coupled with knowledge of reprocessing and fast reactors. Mr. Medford then played a DVD depicting the company's organization and operations *(AREVA DVD will be submitted with the final communications report*).

GNEP Overview and Development of Energy Corridor

Ms. Shoats then recognized Dr. Mark Turnbough, ELEA Principal Site Investigator, for a presentation on the major objectives and projects associated with the GNEP and a discussion of the development of the existing energy corridor in eastern New Mexico and West Texas.

Dr. Turnbough gave an overview on the GNEP. He discussed the shifting policy focus regarding nuclear energy in this country, open versus closed fuel cycles, and the emergence of GNEP as a significant component of the Energy Policy Act of 2005. The basic concept DOE took from the enabling legislation was to move forward with non-proliferating technology that reuses transuranics, like plutonium, in the fuel cycle. Other strategic initiatives of GNEP are to develop and provide economically viable and environmentally safe nuclear power resources to developing countries and safely manage the fuel they use. Objectives in the U.S. include selecting a site on which at least two of three major proposed GNEP facilities could be located. ELEA is promoting a site between Carlsbad and Hobbs that could accommodate the Consolidate Fuel Reprocessing Center and an Advanced Recycling Reactor. The ELEA site is one of twelve sites around the country presently under consideration. The third facility is a research facility for the advanced fuel cycle. Dr. Turnbough indicated that the research facility would likely go to an existing national lab, a consortium of labs, or a consortium of labs and universities but that it was location-independent of the other two facilities.

Dr. Turnbough said that DOE was following an aggressive timeline on GNEP and that a site location decision is scheduled for June

2008. The current list of sites would likely be reduced to four or five and then subjected to further analysis in the programmatic environmental impact statement. Final site selection would occur in June of 2008. ELEA was organized to identify and promote a site in southeastern New Mexico and he believes that the site selected is well characterized and meets all the criteria necessary for the development of the two facilities envisioned by GNEP.

Dr. Turnbough reiterated the strong points of the ELEA site and moved into a discussion of the energy corridor concept as a consideration relative to GNEP siting. He noted the close proximity of several energy related facilities such as WIPP; Waste Control Specialists in the adjacent Andrews County, Texas; LES; and the proposed construction of the University of Texas research reactor, also in Andrews County. Dr. Turnbough cited the relative proximity of several major research universities and national labs (Sandia and Los Alamos) that are relatively close to the ELEA site.

Dr. Turnbough played a video of the operations of the AREVA reprocessing plant in La Hague, France, to demonstrate the major steps in reprocessing *(AREVA DVD will be submitted with the final communications report)*. Following the video Dr. Turnbough explained that the process at La Hague is different than the proliferation-resistant process proposed in the GNEP.

Dr. Turnbough explained that one of the primary objectives of GNEP is to reduce the amount of unusable long-lived radio-nuclides in order to make long-term disposal projects such as Yucca Mountain more feasible and long lived.

Dr. Turnbough stated that the scope of GNEP will provide a significant opportunity to utilize the tremendous intellectual resources that exist at the region's national labs and research universities. It will also be able to draw from a very receptive, mobile, highly trained, and reliable workforce of skilled technicians and trades persons that are currently in place to handle the development construction and operation of LES. The existing experience of the communities in the region with respect to nuclear energy projects has to be considered as an advantage of the energy corridor. A culture of public knowledge and acceptance based on the safe operation of existing facilities and the open processes followed in siting of existing and developing projects is beneficial.

Round Table Discussion and Public Comment

Ms. Shoats recognized Dr. Askew who described CEMRC's role in researching the epidemiological data of Carlsbad and Eddy County residents, which began two years prior to any active shipments to the WIPP site. These baseline data are unique to the ELEA site and help reassure the public that these facilities are operated safely and professionally and consequently do not pose an undue health or safety risk to the community.

Dr. Askew also pointed out that he was working with the Carlsbad Branch of NMSU to establish a two-year training program for energy industry workers. The Associate Degree would be granted in hazardous and radioactive material technology management. There is also a one-year program being developed for tradesmen and craftsmen working in the industry. In addition, Dr. Askew is working with the Department of Engineering at NMSU to develop a minor in nuclear engineering and chemistry. The Carlsbad Branch is also developing programs in Engineering Technology for advanced welding machining and other technologies. He said, "We are very vested in providing education and training for all these projects."

Ms. Shoats thanked Dr. Askew for his comments and recognized Dr. Castillo, Dean of the College of Engineering at NMSU. Dr. Castillo expressed his excitement for the project and further noted the role of the university in serving the needs of the citizens of New Mexico and that the mission of the land-grant institution is education, outreach, and research. Dr. Castillo stated that having a well-educated and trained workforce was essential to economic development and that research – especially in the critical area of energy – was critical to address the challenges facing the United States and the world. He related his experience to the leaders of the ELEA and expressed his support for the projects and the GNEP and appreciated the opportunity to work with the partnership. Dr. Castillo discussed several NMSU programs such as the Waste Education and Research Consortium (WERC) that does environmental research that could be utilized on projects such as GNEP. He also referenced other programs at New Mexico Tech and the University of New Mexico that could also be beneficial to the GNEP effort and that by working together these institutions could provide a significant portion of the manpower required.

Ms. Shoats thanked Dr. Castillo and recognized Representative Heaton for comment.

Representative Heaton stated that Dr. Castillo sits on the board of the Center for Excellence and Hazardous Materials Management based in Carlsbad and that he has been a very productive member of the Board. Representative Heaton also stated that in terms of nuclear engineering there are probably only 16 to 18 such programs in existence in the U.S at the present time and encouraged the development of new programs now that “nuclear” is re-emerging.

Ms. Shoats recognized Jerry Vaughn, Business Agent for the United Association of Plumbers and Steam Fitters. Mr. Vaughn stated that historically the Permian Basin has experienced feast or famine where economic upturns and downturns are concerned and it has been totally dependent on the oil and gas industry. He hopes that these new projects – WIPP, LES, and hopefully the GNEP and other developments – will stabilize the area economically. Mr. Vaughn indicated that the New Mexico Building Trades have already committed to put in the resources, time, and effort to assist in training workers for the LES projects and would do the same for the GNEP. Mr. Vaughn also pointed out the ripple effect on the local economy of all the new well-paying and permanent jobs.

Representative Heaton noted that the community was used to having a large influx of workers come into the community because of the experience with the boom-and-bust cycle of the oil and gas industry and that it was not unusual for the community to adjust and accommodate 1500 new workers in a matter of a few months. Representative Heaton also said the timing of the completion of construction on the LES facility and the timeline for the beginning of construction on GNEP facilities would correspond well and that the LES construction workforce could move into the GNEP projects.

Ms. Shoats thanked Mr. Vaughn for his participation and commitment to help provide a critical element in the project, which is a stabile, well trained workforce. Ms. Shoats then asked Mr. Weaks of Shoats and Weaks Inc. to present information on some of the programs, resources, and projects that are in place at the universities and in state government that could assist in the GNEP.

Mr. Weaks reiterated the magnitude of the project and the potential job creation. He stated that such growth would create a significant challenge with respect to workforce development and training. This will require every higher-education institution (two-year and research), local government,

state government, the state legislature, public school, labor organization, and business to collaborate in the effort to develop the workforce to enable the projects to be developed.

Mr. Weaks indicated that there are presently several programs that the legislature has funded that could be utilized for actual training relative to projects like the GNEP. These existing programs include the Geophysical Research Center, to be run by New Mexico Tech in Hobbs, for which the legislature appropriated $250,000 this session; the New Mexico Research Collaborative, which includes a consortium of all higher-education institutions that is chaired by former Governor Carruthers, who is now director of the Arrowhead Center for Economic Development at NMSU. This organization has received up to $2 million in appropriations and an estimated $500,000 was appropriated during the 2007 legislative session.

Mr. Weaks added that the President of New Mexico Tech, Dr. Dan Lopez, and his Vice President for Research and Development, Dan Romero, unfortunately had a last-minute scheduling conflict and were unable to attend. However, Dr. Lopez sent his regrets and wanted to state that Tech is very supportive of this effort and looks forward to participating in the GNEP project. Dr. Lopez is also the Chairman of the Council of University Presidents in New Mexico and will bring the project to the attention of that group and arrange for their participation as well.

Mr. Weaks began the discussion of the DOE funding opportunities that are program grants for academic readiness relative to GNEP and the development of research collaborative. Copies of the grants were distributed *(Attachment E. Federal Grant Proposals)*. Mr. Turnbough noted that the response deadlines for two of the programs were in May and early June and encouraged participation. One of the grants in particular is to specifically enhance synergies by partnering with nontraditional institutions, such as colleges and universities with strong minority enrollment. The Roundtable discussed the strength that New Mexico's academic institutions have in regard to minority enrollment and recruitment.

The Roundtable discussed an additional activity that should be considered relative to the preparation for GNEP: To develop an inventory of existing workforce resources, working with the two-year institutions, labor organizations, the Technology Research Collaborative, State government agencies, national labs, and retired scientists and engineers that may have an interest. Representative Heaton stated that he thought he would be chairing the legislative interim committee on Radioactive and Hazardous Materials this year. The Roundtable discussed the importance of the ELEA presenting the GNEP to the appropriate legislative interim committees and that the timeline for the GNEP is very aggressive and the work-force readiness and academic readiness are not issues that can be handled in a month or two. There was agreement within the Roundtable that there would have to be a great collaborative effort to get ahead of the curve on the project and take advantage of the biggest economic development opportunity in the recent history of the state.

Dr. Turnbough then stated that it was his understanding that DOE had extended the public comment process into June and if that was the case then we should maintain continuity in the communications process among interested parties such as the university system and of course the public. ELEA will be requesting that DOE continue funding so that ELEA can follow-up on some of the initiatives Mr. Weaks spoke about in order to consolidate the institutional support system. Dr. Turnbough again stated that the site was more that acceptable, but that the ELEA really needed to demonstrate that we have the

university infrastructure to build on the proposed technology.

Dr. Turnbough said that the scope of the project is so big that DOE is starting to realize the costs are going to be very significant and that the corporate partners that are involved with ELEA were strong and capable of participating financially in order to get the projects done by accelerating the timetable and drawing on existing university resources. The end result is the development of a viable, safe and economically profitable closed-fuel cycle that generates electricity, and a lot of it.

Representative Heaton discussed a new appropriation that the legislature made during the 2007 Legislative Session of approximately $10 million for alternative fuels research and development that was to be directed toward universities and the private sector.

Dr. Castillo asked for additional information about the future of federal funding for GNEP given the recent changes in Congress.

Dr. Turnbough responded that the budget for these initiatives was recently published in the Federal Register. Representative Heaton noted that Congress is quickly coming to the realization that in order to remain competitive in the world economy the U.S has to solve its energy problems and that we can no longer import 65% of our oil from politically unstable countries. GNEP is a big part of the answer, especially the solution of dealing with waste.

Dr. Castillo thanked everyone and said he was scheduled to attend a banquet for the WERC program that evening where Senator Bingaman would be the keynote speaker. He said he would be talking to the Senator about the GNEP proposal.

Ms. Shoats recognized Mr. Tony Burris, the associate dean and deputy director of the Physical Science Laboratory (PSL) at NMSU. Mr. Burris explained the role and activities of the PSL at NMSU and noted that they received funds from contracts from various federal agencies and private enterprise. Mr. Burris said that PSL has worked on several projects in Carlsbad and has been discussing the possibility of doing some work on radiological dispersal devices. He said that he could certainly see where this capability would allow for related research and engineering that would look at the signatures of the plants and their capabilities. He stated the PSL capabilities would be available to assist in the GNEP as needed.

Dr. Askew then added that he would like to get started on applications for the GNEP university readiness grants immediately. Specifically, Dr. Askew would like to develop an inventory of related resources among higher-education institutions, including two-year schools. He requested that the partners WGI and AREVA provide copies of job descriptions for types of jobs that the GNEP will require. This will enable the curriculum planners and administrators to acquire “off-the-shelf and accredited classes” and develop faculty qualifications and class structures designed to turn out qualified workers. Dr. Askew indicated he would like to work with anyone interested in pursuing this grant and project and stressed the criticality of moving inclusively and quickly.

Ms. Shoats then asked if anyone else in attendance would like to comment.

Mr. Dominic Silva, a resident of Las Cruces and a businessman, indicated that he attended the meeting to learn more about the project and to understand the technology and scope of GNEP. He indicated that the closed-fuel cycle concept was something that he was not fully aware of but found it to be a fascinating issue. He also stated that he believed GNEP to be a great opportunity for the universities to coordinate with the public sector and to do really good things for the rural communities.

Mr. Silva said the economic development would create stability in those areas. He encouraged the universities and colleges to get on board with the projects and fully participate.

Mr. Rudy Zamora introduced himself as the marketing representative for the Plumbers and Pipe Fitters. Local Union 412 in Southern New Mexico and ten southern counties in Texas. Mr. Zamora also represents the New Mexico Construction Trades Council with over 7,000 members. Mr. Zamora expressed his excitement about the project and being able to attend the meeting. He noted that he appreciated the information that was presented and that it helped to explain the concept of the GNEP and the experience and qualifications of the partners. Mr. Zamora said that he wanted to understand not only the aspects of the project and facilities relative to construction and building but also the partnership and community participation and workforce requirements. Mr. Zamora indicated that the organizations he represents could be of great assistance in providing training, apprenticeship programs, technical trades classes and all types of instructional safety classes. He also pointed out that there were already examples of building and maintenance agreements with Sandia National Labs and Los Alamos Laboratory and that they were in discussions with LES. Mr. Zamora stated his organizations enthusiasm to reach out to all those involved in the GNEP proposal and indicated he wanted to work together on the project.

In conclusion, Ms. Shoats then asked if there were any more comments from either the Roundtable or other attendees. She stated that many significant comments were made about continuing the collaboration efforts with the ELEA for the GNEP. She noted that the Roundtable Discussion and Public Meeting in Las Cruces demonstrated the strength and support of the academic community in New Mexico, and that the previous three Public Participation Meeting's were heavily attended and strongly supported. She indicated that the results of the Public Participation Meetings and the strength of the Academic Institutions further demonstrate the unique characteristics of the ELEA site. Ms. Shoats thanked NMSU for hosting the meeting at which point the ELEA Public Meeting and Roundtable Discussion in Las Cruces was adjourned.

Attachment A. Affidavits of Public Notice

PROOF OF PUBLICATION

Lou Hendren, being duly sworn, deposes and says that he is the Classified Manager of the Las Cruces Sun-News, a newspaper published daily in the county of Dona Ana, State of New Mexico; that the notice 36984 per clipping attached was published once a week/day in regular and entire issue of said newspaper and not in any supplement thereof for 3 consecutive week(s)/day(s), the first publication was in the issue dated March 31, 2007 and the last publication was April 3, 2007.

Dependent further states this newspaper is duly qualified to publish legal notice or advertisements within the meaning of Sec. Chapter 167, Laws of 1937.

Signed [signature]

Classified Manager
Official Position

STATE OF NEW MEXICO
ss.
County of Dona Ana

Subscribed and sworn before me this

5th day of April

2007.

Anne M Jacobs
Notary Public in and for
Dona Ana County, New Mexico
March 23, 2011
My Term Expires

Las Cruces, NM
Panel Discussion
and
Public Meeting Notice

Notice of Public Participation Meeting: The Eddy-Lea County Alliance, LLC will hold a roundtable discussion to provide information about the Global Nuclear Energy Partnership's (GNEP) process and the potential of locating two major GNEP facilities at the Eddy-Lea Energy Alliance Site, which is approximately halfway between Hobbs and Carlsbad on Highway 62/180.

Date: Wednesday April 4, 2007
Location: NMSU
Physical Science Lab
Clinton P. Anderson Hall
Conference Room
Las Cruces, NM
Request: The public is invited to participate and provide comment on proposed project

Time and
Place of Hearing:
3-6PM
NMSU
Physical Science Lab
Clinton P. Anderson Hall
Conference Room
Las Cruces, NM

Contact: Jennifer Garcia Kozlowski 505.890.3306
Marie [illegible] 505.890.8506

Pub No. 36984
Pub Dates: March 31, April 1, 3, 2007

Las Cruces, NM
Panel Discussion
and
Public Meeting Notice

Notice of Public Participation Meeting: The Eddy-Lea County Alliance, LLC will hold a roundtable discussion to provide information about the Global Nuclear Energy Partnership's (GNEP) process and the potential of locating two major GNEP facilities at the Eddy-Lea Energy Alliance Site; which is approximately half way between Hobbs and Carlsbad on Highway 62/180

Date:	Wednesday April 4, 2007
Location:	NMSU Physical Science Lab Clinton P. Anderson Hall Conference Room Las Cruces, NM
Request:	The public is invited to participate and provide comment on proposed project

Time and Place of Hearing:

3-6PM
NMSU
Physical Science Lab
Clinton P. Anderson Hall
Conference Room
Las Cruces, NM

Contact: Jennifer Garcia Kozlowski 505.890.0306
Marla Shoats 505.890.0306

Attachment B. Sign In Sheets

Eddy-Lea Energy Alliance, LLC

Global Nuclear Energy Partnership (GNEP)

Las Cruces, NM
April 4, 2007

First Name	Last Name	Company	Address	City	Zip	Phone #	Email
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Rudy	Zamora	UA. Local Union #412	4090 Bataan Memorial	LC	88012	505 382-5152	Rudy2412@aol.com
Jim	Medford	AREVA	7207 IBM Dr.	Charlotte N.C.	28262	704-805-2408	James.Medford@AREVA.com
Frederic	Bailly	AREVA	4800 Hampden Ln	Bethesda MD	20814	202 375 8407	fred.bailly.ctr@AREVA.com
Domonic	Silva	Kimble & Assoc.	511 La Melodia	Las Cruces	88011	505-650-4082	domonicsilva@msn.com
Art	Chavez	Washington Group Intl.	P.O. Box 2078	Carlsbad	88220	505-234-7455	art.chavez@wsms.com
CARLOS	CASTANEDA	STATE LABOR DEPT.	401 BROADWAY ABQ 87102	ABQ	87102	841 845	CCastaneda@state.nm.us
Ball	McCamley	Dona Ana County Commission	845N Motel Blvd	LC	88007	647-7201	

Eddy-Lea Energy Alliance, LLC

Global Nuclear Energy Partnership (GNEP)

Las Cruces, NM
April 4, 2007

First Name	Last Name	Company	Address	City	Zip	Phone #	Email
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Edward	Askew	CEMRC	1400 University Carlsbad NM 88220	Carlsbad	88220	505-234-5502	easkew@cemrc.org
DAN	WEAKS	SHOATS & WEAKS INC	9631 4TH NW 87114	ALB	87114	505-890-0206	DANWEAKS@COMCAST.NET
Tony	Burris	NMSU/PSL					tburris@PSL.NMSU.edu
Jerry	Vaughn Bus. Rep.	UA Local 412 Plumbers + Pipefillers	510 SanPedro SE	ALB	87018	(505) 6440919	JerryU412@AOL.com
Miriam	Whatley	WGI	P.O. Box 2078	Carlsbad	88220	505 234-8639	miriam.whatley@wgint.com

Attachment C. ELEA Agenda

EDDY-LEA ENERGY ALLIANCE, LLC

Global Nuclear Energy Partnership

Wednesday, April 4, 2007
PSL
3PM
Las Cruces, New Mexico

I. *Welcome*

Dan Weaks and Marla Shoats

II. *ELEA Introduction*

Representative John Heaton

III. *Corporate Partnership*

Bob Kehrman Washington Group International

Jim Medford AREVA

IV. *GNEP Overview*

Mark Turnbough, Ph.D

V. *Development of Energy Corridor*

Mark Turnbough, Ph.D

VI. *University Research/Funding Opportunities*

Mark Turnbough, Ph.D

Dan Weaks

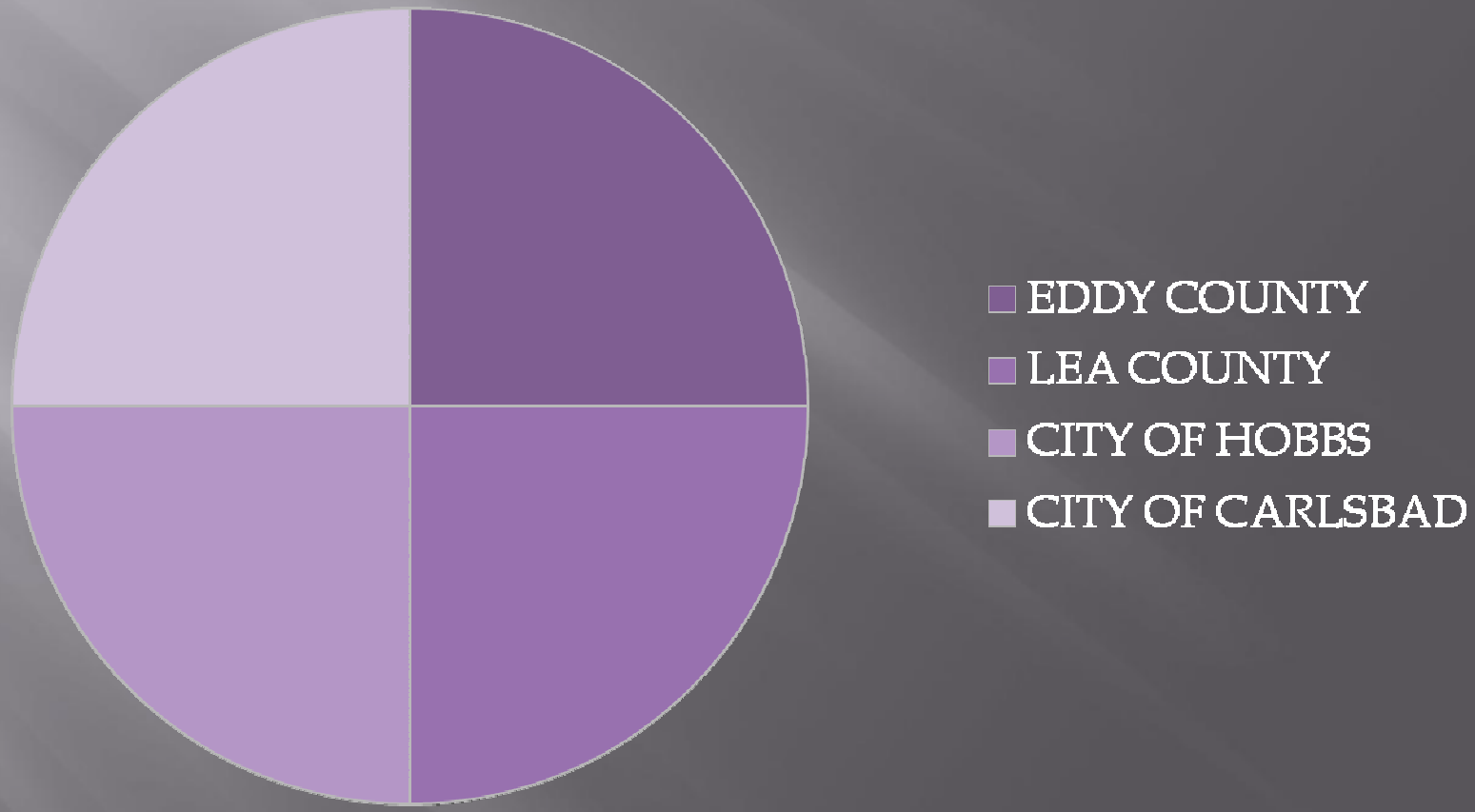
Public Comment

ELEA
PO BOX 905
HOBBS NM 99240

Attachment D. ELEA Slides

EDDY-LEA ENERGYALLIANCE, LLC

OWNERSHIP OF LLC PER PUBLIC ENTITY



EDDY-LEA ENERGY ALLIANCE, LLC

BOARD MEMBERS

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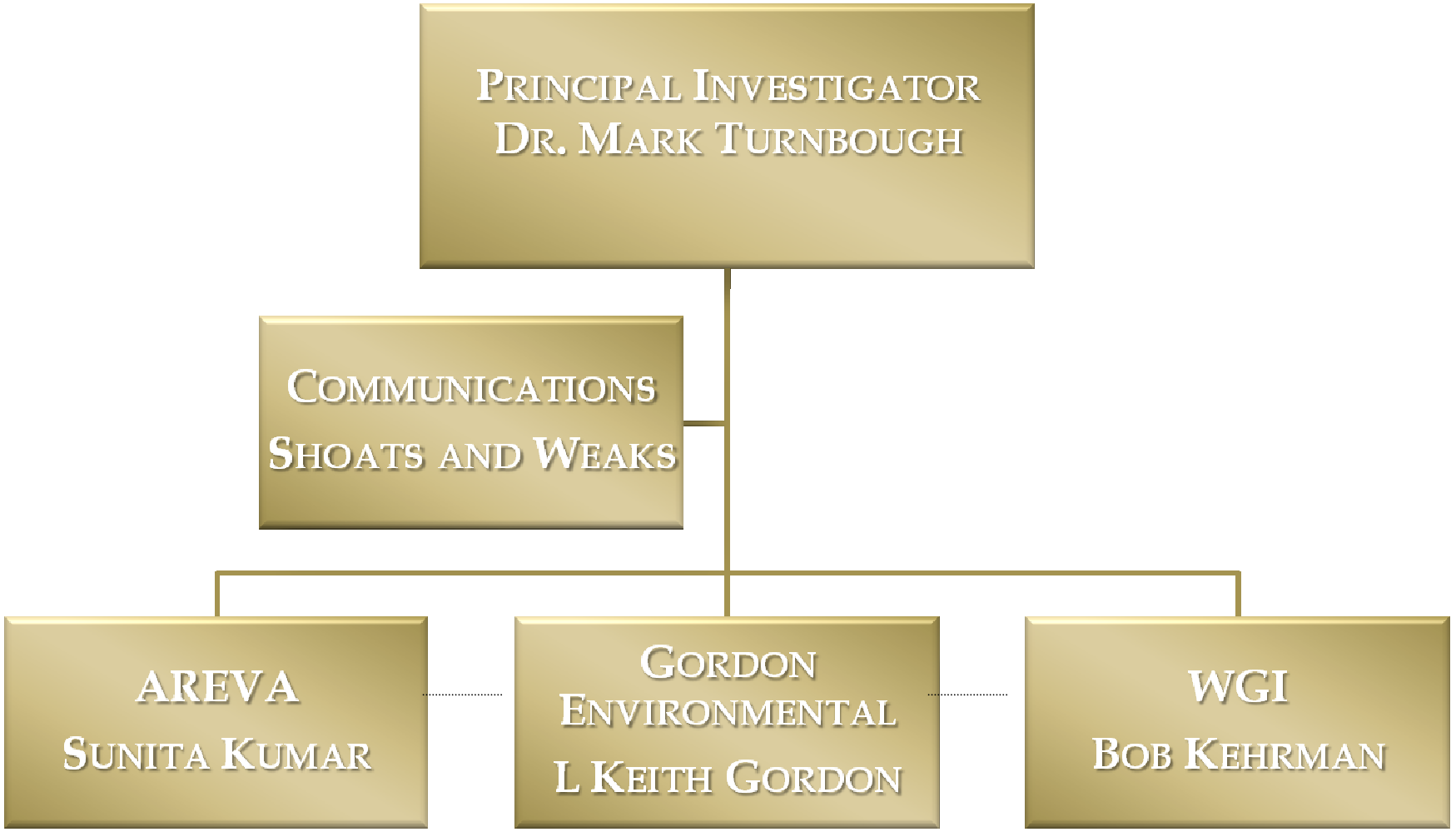
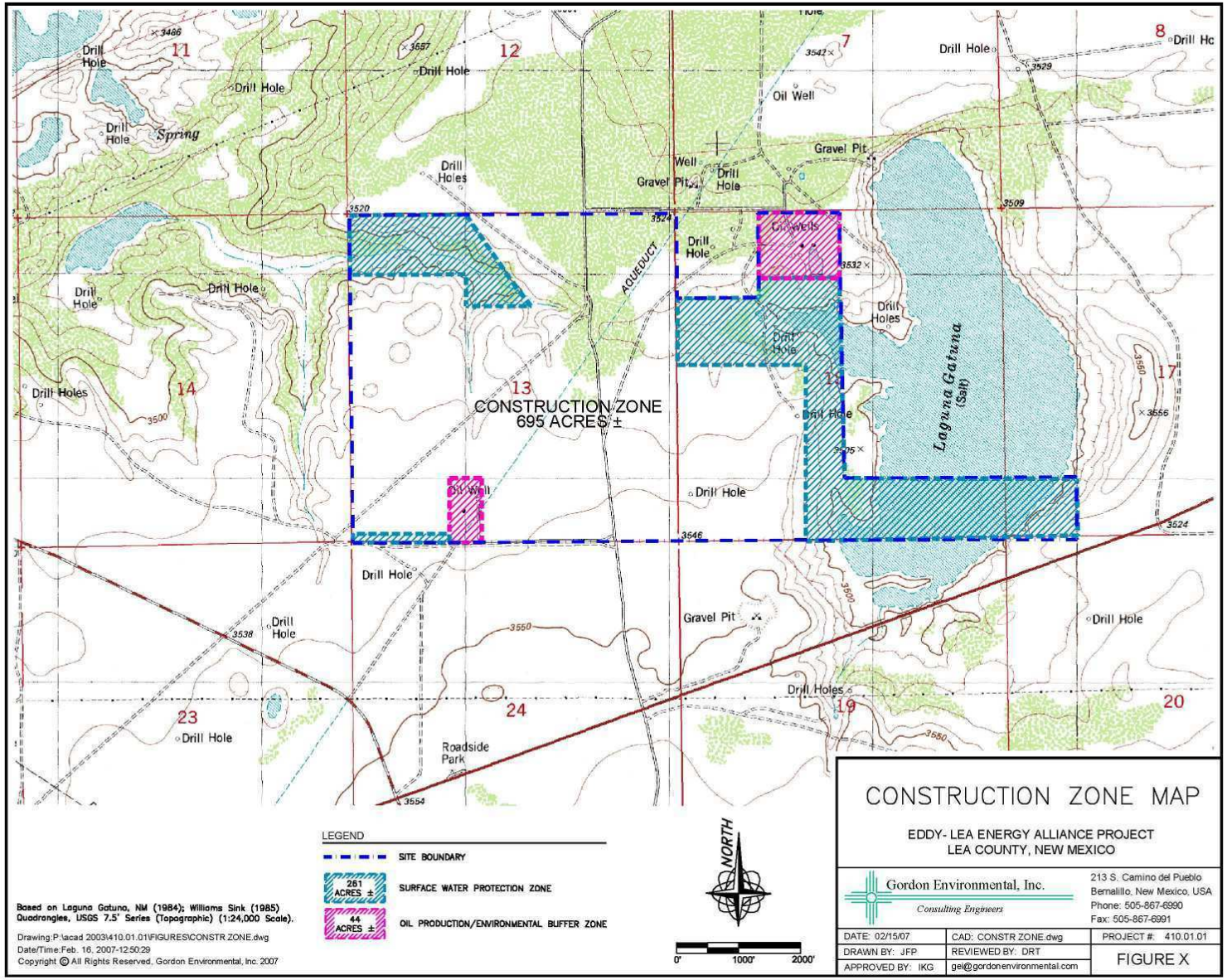


EDDY-LEA ENERGY ALLIANCE, LLC GNEP SITING STUDIES AREA



Attachment E. Federal Grant Proposals

FINANCIAL ASSISTANCE
FUNDING OPPORTUNITY ANNOUNCEMENT

U.S. Department of Energy

Idaho Operations Office

Global Nuclear Energy Partnership University Readiness

Funding Opportunity Number: **DE-PS07-07ID14817**

Announcement Type: **Initial**

CFDA Number: **81.121**

Issue Date: **03/29/2007**

Application Due Date: **06/07/2007** at 11:59:59 PM Eastern Time

This announcement will remain open until the Application Due Date. Applications may be submitted any time before the announcement closes.

NOTE: REQUIREMENTS FOR GRANTS.GOV

Where to Submit: Applications must be submitted through Grants.gov to be considered for award. You cannot submit an application through Grants.gov unless you are registered. Please read the registration requirements carefully and start the process immediately. Remember you have to update your CCR registration annually. If you have any questions about your registration, you

should contact the Grants.gov Helpdesk at 1-800-518-4726 to verify that you are still registered in Grants.gov.

Registration Requirements: There are several one-time actions you must complete in order to submit an application through Grants.gov (e.g., obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number, register with the Central Contract Registry (CCR), register with the credential provider, and register with Grants.gov). See www.grants.gov/GetStarted. Use the Grants.gov Organization Registration Checklist at http://www.grants.gov/assets/OrganizationRegCheck.doc to guide you through the process. Designating an E-Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in the CCR registration process. Applicants, who are not registered with CCR and Grants.gov, should allow at least 21 days to complete these requirements. It is suggested that the process be started as soon as possible.

IMPORTANT NOTICE TO POTENTIAL APPLICANTS: When you have completed the process, you should call the Grants.gov Helpdesk at 1-800-518-4726 to verify that you have completed the final step (i.e. Grants.gov registration).

Questions: Questions relating to the registration process, system requirements, how an application form works, or the submittal process must be directed to Grants.gov at 1-800-518-4726 or support@grants.gov. Part VII of this announcement explains how to submit other questions to the U.S. Department of Energy.

Application Receipt Notices

After an application is submitted, the Authorized Organization Representative (AOR) will receive a series of five e-mails. It is extremely important that the AOR watch for and save each of the e-mails. It may take up to two (2) business days from application submission to receipt of e-mail Number 2. When the AOR receives e-mail Number 5, it is their responsibility to follow the instructions in the e-mail to logon to IIPS and verify that their application was received by DOE. The titles of the five e-mails are:

Number 1 - Grants.gov Submission Receipt Number
Number 2 - Grants.gov Submission Validation Receipt for Application Number
Number 3 - Grants.gov Grantor Agency Retrieval Receipt for Application Number
Number 4 - Grants.gov Agency Tracking Number Assignment for Application Number
Number 5 - DOE e-Center Grant Application Received

The last e-mail will contain instructions for the AOR to register with the DOE e-Center. If the AOR is already registered with the DOE e-Center, the title of the last e-mail changes to:

Number 5 - DOE e-Center Grant Application Received and Matched

This e-mail will contain the direct link to the application in IIPS. The AOR will need to enter their DOE e-Center user id and password to access the application.

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PART I – FUNDING OPPORTUNITY DESCRIPTION

Global Nuclear Energy Partnership (GNEP) seeks to develop worldwide consensus on enabling expanded use of economical, carbon-free nuclear energy to meet growing electricity demand. This will use a nuclear fuel cycle that enhances energy security, while promoting non-proliferation. It would achieve its goal by having nations with secure, advanced nuclear capabilities provide fuel services — fresh fuel and recovery of used fuel — to other nations who agree to employ nuclear energy for power generation purposes only. The closed fuel cycle model envisioned by this partnership requires development and deployment of technologies that enable recycling and consumption in fast reactors of long-lived radioactive waste.

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Further highlights of the GNEP program are contained in the GNEP website (http://www.gnep.energy.gov/).

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STATEMENT OF OBJECTIVES: The Department of Energy is seeking applications from universities for capability expansion that will directly enable them to support GNEP research and development programs. Capability expansion is defined as laboratory upgrades, faculty support, graduate fellowships, reactor improvements, equipment purchases or upgrades, curriculum development/enhancement, international student exchange or other similar things that will positively impact a university 's ability to compete in future GNEP R&D solicitations, in order to support the GNEP R&D program.

PART II – AWARD INFORMATION

A. **TYPE OF AWARD INSTRUMENT.**
DOE anticipates awarding grants under this program announcement.

B. **ESTIMATED FUNDING.**
Approximately $4,000,000 is expected to be available for new awards under this announcement.

C. **MAXIMUM AND MINIMUM AWARD SIZE**
Ceiling (i.e., the maximum amount for an individual award made under this announcement) $ 100,000

Floor (i.e., the minimum amount for an individual award made under this announcement) $ None

D. **EXPECTED NUMBER OF AWARDS.**
DOE anticipates making approximately 40 awards under this announcement.

E. **ANTICIPATED AWARD SIZE**.
DOE expects to fund up to $100,000 per year for up to 1 years. If requested levels are higher, applicants must justify need for more funds consistent with the ceiling on individual awards described in paragraph C above.

F. **PERIOD OF PERFORMANCE.**
DOE anticipates making awards that will run for up to 1 years.

G. **TYPE OF APPLICATION.**
DOE will accept new applications under this announcement.

PART III – ELIGIBILITY INFORMATION

A. **ELIGIBLE APPLICANTS.**

Eligibility for award is restricted to U.S. colleges and universities and State owned research institutions with nuclear engineering degree programs or equivalent of a minor in nuclear engineering, or licensed, operating reactor. Universities that utilize a non-university, state-operated reactor in their state are also eligible to apply. Also eligible are Historically Black Colleges and Universities and Hispanic Serving Institutions that currently have nuclear programs or a program partnering with another school having a nuclear engineering program.

B. **COST SHARING.**

Cost sharing is not required.

C. **OTHER ELIGIBILITY REQUIREMENTS.**

None.

PART IV – APPLICATION AND SUBMISSION INFORMATION

A. **ADDRESS TO REQUEST APPLICATION PACKAGE.**

Application forms and instructions are available at Grants.gov. To access these materials, go to http://www.grants.gov, select "Apply for Grants," and then select "Download Application Package." Enter the CFDA and/or the funding opportunity number located on the cover of this announcement and then follow the prompts to download the application package. NOTE: You will not be able to download the Application Package unless you have installed PureEdge Viewer (See: http://www.grants.gov/DownloadViewer).

B. **LETTER OF INTENT AND PRE-APPLICATION.**

1. Letter of Intent.

Letters of Intent are not required.

2. Pre-application.

Pre-applications are not required.

C. **CONTENT AND FORM OF APPLICATION – SF 424**

You must complete the mandatory forms and any applicable optional forms (e.g., SF-LLL-Disclosure of Lobbying Activities) in accordance with the instructions on the forms and the additional instructions below. **Files that are attached to the forms must be in Adobe Portable Document Format (PDF) unless otherwise specified in this announcement.**

1. SF 424 - Application for Federal Assistance.

Complete all required fields in accordance with the pop-up instructions on the form. To activate the instructions, turn on the "Help Mode" (Icon with the pointer and question mark at the top of the form). The list of certifications and assurances referenced in Field 21 can be found on the Applicant and Recipient Page at http://grants.pr.doe.gov, under Certifications and Assurances.

2. Other Attachments Form.

Submit the following files with your application and attach them to the Other Attachments Form. Click on "Add Mandatory Other Attachment" to attach the Project Narrative. Click on "Add Optional Other Attachment," to attach the other files.

Project Narrative File - Mandatory Other Attachment

The project narrative must not exceed 6 pages, including cover page, table of contents, charts,

graphs, maps, photographs, and other pictorial presentations, when printed using standard 8.5" by 11" paper with 1 inch margins (top, bottom, left, and right). EVALUATORS WILL REVIEW ONLY THE NUMBER OF PAGES SPECIFIED IN THE PRECEDING SENTENCE. The font must not be smaller than Arial 11 point. Do not include any Internet addresses (URLs) that provide information necessary to review the application. See Part VIII.D for instructions on how to mark proprietary application information. Save the information in a single file named "Project.pdf," and click on "Add Mandatory Other Attachment" to attach.

The project narrative must include:

Project Objectives. This section should provide a clear, concise statement of the specific objectives/aims of the proposed project.

Merit Review Criterion Discussion. The section should be formatted to address each of the merit review criterion and sub-criterion listed in Section V. A. Provide sufficient information so that reviewers will be able to evaluate the application in accordance with these merit review criteria. DOE/NNSA WILL EVALUATE AND CONSIDER ONLY THOSE APPLICATIONS THAT ADDRESS SEPARATELY EACH OF THE MERIT REVIEW CRITERION AND SUB-CRITERION.

Project Summary/Abstract File

The project summary/abstract must contain a summary of the proposed activity suitable for dissemination to the public. It should be a self-contained document that identifies the name of the applicant, the project director/principal investigator(s), the project title, the objectives of the project, a description of the project, including methods to be employed, the potential impact of the project (i.e., benefits, outcomes), and major participants (for collaborative projects). This document must not include any proprietary or sensitive business information as the Department may make it available to the public. The project summary must not exceed 1 page when printed using standard 8.5" by 11" paper with 1" margins (top, bottom, left and right) with font not smaller than Arial 11 point. Save this information in a file named "Summary.pdf," and click on "Add Optional Other Attachment" to attach.

Provide a resume for each key person proposed, including subawardees and consultants if they meet the definition of key person. A key person is any individual who contributes in a substantive, measurable way to the execution of the project. Save all resumes in a single file named "bio.pdf" and click on "Add Optional Other Attachment" to attach. The biographical information for each resume must not exceed 2 pages when printed on 8.5" by 11" paper with 1 inch margins (top, bottom, left, and right) with font not smaller than Arial 11 point and should include the following information, if applicable:

Education and Training. Undergraduate, graduate and postdoctoral training, provide institution, major/area, degree and year.

Professional Experience. Beginning with the current position list, in chronological order, professional/academic positions with a brief description.

Publications. Provide a list of up to10 publications most closely related to the proposed project. For each publication, identify the names of all authors (in the same sequence in which they appear in the publication), the article title, book or journal title, volume number, page numbers, year of publication, and website address if available electronically.

Patents, copyrights and software systems developed may be provided in addition to or substituted for publications.

Synergistic Activities. List no more than 5 professional and scholarly activities related to the effort proposed.

SF 424 A Excel, Budget Information – Non-Construction Programs File:
You must provide a separate budget for each year of support requested and a cumulative budget for the total project period. Use the SF 424 A Excel, "Budget Information – Non Construction Programs" form on the Applicant and Recipient Page at http://grants.pr.doe.gov. You may request funds under any of the Object Class Categories as long as the item and amount are necessary to perform the proposed work, meet all the criteria for allowability under the applicable Federal cost principles, and are not prohibited by the funding restrictions in this announcement (See PART IV, G). Save the information in a single file named "SF424A.xls," and click on "Add Optional Other Attachment" to attach.

Budget Justification File
You must justify the costs proposed in each Object Class Category/Cost Classification category (e.g., identify key persons and personnel categories and the estimated costs for each person or category; provide a list of equipment and cost of each item; identify proposed subaward/consultant work and cost of each subaward/consultant; describe purpose of proposed travel, number of travelers and number of travel days; list general categories of supplies and amount for each category; and provide any other information you wish to support your budget). Provide the name of your cognizant/oversight agency, if you have one, and the name and phone number of the individual responsible for negotiating your indirect rates. If cost sharing is required, you must have a letter from each third party contributing cost sharing (i.e., a party other than the organization submitting the application) stating that the third party is committed to providing a specific minimum dollar amount of cost sharing. In the budget justification, identify the following information for each third party contributing cost sharing: (1) the name of the organization; (2) the proposed dollar amount to be provided; (3) the amount as a percentage of the total project cost; and (4) the proposed cost sharing – cash, services, or property. By submitting your application, you are providing assurance that you have signed letters of commitment. Successful applicants will be required to submit these signed letters of commitments. Save the budget justification information in a single file named "Budget.pdf," and click on "Add Optional Other Attachment" to attach.

3. SF-LLL Disclosure of Lobbying Activities
If applicable, complete SF- LLL. Applicability: If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the grant/cooperative agreement, you must complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying."

Summary of Required Forms/Files
Your application must include the forms fromn the application package and other documents as shown below:

Name of Document	Format	File Name
SF 424 - Application for Federal Assistance		N/A
Other Attachments Form: Attach the following files to this form:		N/A
Project Narrative File	PDF	Project.pdf
Project Summary/Abstract File	PDF	Summary.pdf
Resume File	PDF	Bio.pdf
SF 424A Excel - Budget Information for Non-Construction Programs File	Excel	SF242A.xls
Budget Justification File	PDF	Budget.pdf
SF-LLL Disclosure of Lobbying Activities, if applicable.		N/A

D. **SUBMISSIONS FROM SUCCESSFUL APPLICANTS**.
If selected for award, DOE reserves the right to request additional or clarifying information for any reason deemed necessary, including, but not limited to:

a. Indirect cost information
b. Other budget information
c. Name and phone number of the Designated Responsible Employee for complying with national policies prohibiting discrimination (See 10 CFR 1040.5)
d. Representation of Limited Rights Data and Restricted Software, if applicable
e. Commitment Letter from Third Parties Contributing to Cost Sharing, if applicable

E. **SUBMISSION DATES AND TIMES**

1. Pre-application Due Date.
Pre-applications are not required.

2. Application Due Date.
Applications should be received by 06/07/2007, 11:59:59 PM Eastern Time. You are encouraged to transmit your application well before the deadline. The Grants.gov Helpdesk is not available after 9:00 PM Eastern Time. APPLICATIONS RECEIVED AFTER THE DEADLINE WILL NOT BE REVIEWED OR CONSIDERED FOR AWARD.

F. **INTERGOVERNMENTAL REVIEW**
This program is not subject to Executive Order 12372 – Intergovernmental Review of Federal Programs.

G. **FUNDING RESTRICTIONS.**
Cost Principles. Costs must be allowable in accordance with the applicable Federal cost principles referenced in 10 CFR part 600. The cost principles for commercial organization are in FAR Part 31.

Pre-award Costs. Recipients may charge to an award resulting from this announcement pre-award costs that were incurred within the ninety (90) calendar day period immediately preceding the effective date of the award, if the costs are allowable in accordance with the applicable Federal cost principles referenced in 10 CFR part 600. Recipients must obtain the prior approval of the contracting officer for any pre-award costs that are for periods greater than this 90 day calendar period.

Pre-award costs are incurred at the applicant's risk. DOE is under no obligation to reimburse such costs if for any reason the applicant does not receive an award or if the award is made for a lesser amount than the applicant expected.

H. **OTHER SUBMISSION AND REGISTRATION REQUIREMENTS**

1. Where to Submit.
APPLICATIONS MUST BE SUBMITTED THROUGH GRANTS.GOV TO BE CONSIDERED FOR AWARD. Submit electronic applications through the "Apply for Grants" function at www.Grants.gov. If you have problems completing the registration process or submitting your application, call Grants.gov at 1-800-518-4726 or send an e-mail to support@grants.gov.

2. Registration Process.

You must COMPLETE the one-time registration process (all steps) before you may submit your first application through Grants.gov (See www.grants.gov/GetStarted. **We recommend that you start this process at least three weeks before the application due date.** It may take 21 days or more to complete the

entire process. Use the Grants.gov Organizational Registration Checklists at http://www.grants.gov/assets/OrganizationRegCheck.doc to guide you through the process. IMPORTANT: During the CCR registration process, you will be asked to designate an E-Business Point of Contact (EBIZ POC). The EBIZ POC must obtain a special password called "Marketing Partner identification Number" (MPIN). When you have completed the process, you should call the Grants.gov Helpdesk at 1-800-518-4726 to verify that you have completed the final step (i.e. Grants.gov registration).

3. Application Receipt Notices.

After an application is submitted, the Authorized Organization Representative (AOR) will receive a series of five e-mails. It is extremely important that the AOR watch for and save each of the e-mails. It may take up to two (2) business days from application submission to receipt of e-mail Number 2. When the AOR receives email Number 5, it is their responsibility to follow the instructions in the email to logon to IIPS and verify that their application was received by DOE. You will need the Submission Receipt Number (e-mail Number 1) to track a submission. The titles of the five e-mails are:

Number 1 - Grants.gov Submission Receipt Number
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Number 5 - DOE e-Center Grant Application Received

The last e-mail will contain instructions for the AOR to register with the DOE e-Center. If the AOR is already registered with the DOE e-Center, the title of the last e-mail changes to:

Number 5 - DOE e-Center Grant Application Received and Matched

This e-mail will contain the direct link to the application in IIPS. The AOR will need to enter their DOE e-Center user id and password to access the application.

Part V - APPLICATION REVIEW INFORMATION

A. CRITERIA

1. Initial Review Criteria.
Prior to a comprehensive merit evaluation, DOE will perform an initial review to determine that (1) the applicant is eligible for an award; (2) the information required by the announcement has been submitted; (3) all mandatory requirements are satisfied; and (4) the proposed project is responsive to the objectives of the funding opportunity announcement.

2. Merit Review Criteria.
1. Potential of the requested equipment, instrumentation, modification, facility enhancement, or curriculum expansion to fulfill GNEP needs by:
- enhancing the performance control or operational capability of reactor systems;
- increasing the quality, safety/security or increasing efficiency of the reactor facility; or
- improving or expanding the research or training capabilities. (60%)
2. Evidence of understanding of GNEP Program. (20%)
3. Clear understanding of applicant's capabilities to support GNEP. (20%)

3. Other Selection Factors.
Evidence of the academic institution's commitment to GNEP.

B. REVIEW AND SELECTION PROCESS.

1. Merit Review.

Applications that pass the initial review will be subjected to a merit review in accordance with the guidance provided in the "Department of Energy Merit Review Guide for Financial Assistance and Unsolicited Proposals." This guide is available under Financial Assistance, Regulations and Guidance at http://professionals.pr.doe.gov/ma5/ma-5web.nsf/?Open.

2. Selection.

The Selection Official will consider the merit review recommendation, program policy factors, and the amount of funds available.

3. Discussions and Award.

The Government may enter into discussions with a selected applicant for any reason deemed necessary, including but not limited to: (1) the budget is not appropriate or reasonable for the requirement; (2) only a portion of the application is selected for award; (3) the Government needs additional information to determine that the recipient is capable of complying with the requirements in 10 CFR part 600; and/or (4) special terms and conditions are required. Failure to resolve satisfactorily the issues identified by the Government will preclude award to the applicant.

C. **ANTICIPATED NOTICE OF SELECTION AND AWARD DATES.**

DOE anticipates notifying applicants selected for award by 07/19/2007 and making awards by 09/28/2007.

Part VI - AWARD ADMINISTRATION INFORMATION

A. **AWARD NOTICES.**

1. Notice of Selection.

DOE will notify applicants selected for award. This notice of selection is not an authorization to begin performance. (See Part IV.G with respect to the allowability of pre-award costs.)

2. Notice of Award.

A Notice of Financial Assistance Award issued by the contracting officer is the authorizing award document. It normally includes, either as an attachment or by reference: 1. Special Terms and Conditions; 2. Applicable program regulations, if any; 3. Application as approved by DOE.; 4. DOE assistance regulations at 10 CFR part 600, or, for Federal Demonstration Partnership (FDP) institutions, the FDP terms and conditions; 5. National Policy Assurances To Be Incorporated As Award Terms; 6. Budget Summary; and 7. Federal Assistance Reporting Checklist, which identifies the reporting requirements.

B. **ADMINISTRATIVE AND NATIONAL POLICY REQUIREMENTS.**

1. Administrative Requirements.

The administrative requirements for DOE grants and cooperative agreements are contained in 10 CFR part 600 (See: http://ecfr.gpoaccess.gov), except for grants made to Federal Demonstration Partnership (FDP) institutions. The FDP terms and conditions and DOE FDP agency specific terms and conditions are located on the National Science Foundation web site at http://www.nsf.gov/awards/managing/fed_dem_part.jsp.

2. Special Terms and Conditions and National Policy Requirements.

Special Terms and Conditions and National Policy Requirements.

The DOE Special Terms and Conditions for Use in Most Grants and Cooperative Agreements are located at http://grants.pr.doe.gov. The National Policy AssurancesTo Be Incorporated As Award Terms are located at http://grants.pr.doe.gov.

Intellectual Property Provisions.

The standard DOE financial assistance intellectual property provisions applicable to the various

types of recipients are located at http://www.gc.doe.gov/techtrans/sipp_matrix.html.

C. **REPORTING.**

Reporting requirements are identified on the Federal Assistance Reporting Checklist, DOE F 4600.2, attached to the award agreement. See Sample Checklist posted on DOE e-Center for the proposed Checklist for this program.

PART VII - QUESTIONS/AGENCY CONTACTS

A. **QUESTIONS**

Questions regarding the content of the announcement must be submitted through the "Submit Question" feature of the DOE Industry Interactive Procurement System (IIPS) at http://e-center.doe.gov. Locate the program announcement on IIPS and then click on the “Submit Question” button. Enter required information. You will receive an electronic notification that your question has been answered. DOE will try to respond to a question within 3 business days, unless a similar question and answer have already been posted on the website

Questions relating to the registration process, system requirements, how an application form works, or the submittal process must be directed to Grants.gov at 1-800-518-4726 or support@grants.gov. DOE cannot answer these questions.

B. **Agency Contact**

Name: Patricia Alexander-Johnson

E-mail address: alexanpa@id.doe.gov

Fax: (208) 526-5548

Telephone: (208) 526-9943

PART VIII - OTHER INFORMATION

A. **MODIFICATIONS.**

Notices of any modifications to this announcement will be posted on Grants.gov and the DOE Industry Interactive Procurement System (IIPS). You can receive an e-mail when a modification or an announcement message is posted by joining the mailing list for this announcement through the link in IIPS. When you download the application at Grants.gov, you can also register to receive notifications of changes through Grants.gov.

B. **GOVERNMENT RIGHT TO REJECT OR NEGOTIATE.**

DOE reserves the right, without qualification, to reject any or all applications received in response to this announcement and to select any application, in whole or in part, as a basis for negotiation and/or award.

C. **COMMITMENT OF PUBLIC FUNDS.**

The Contracting Officer is the only individual who can make awards or commit the Government to the expenditure of public funds. A commitment by other than the Contracting Officer, either explicit or implied, is invalid.

D. **PROPRIETARY APPLICATION INFORMATION.**

Patentable ideas, trade secrets, proprietary or confidentional commercial or financial information, disclosure of which may harm the applicant, should be included in an application only when such

information is necessary to convey an understanding of the proposed project. The use and disclosure of such data may be restricted, provided the applicant includes the following legend on the first page of the project narrative and specifies the pages of the application which are to be restricted:

“The data contained in pages _____ of this application have been submitted in confidence and contain trade secrets or proprietary information, and such data shall be used or disclosed only for evaluation purposes, provided that if this applicant receives an award as a result of or in connection with the submission of this application, DOE shall have the right to use or disclose the data herein to the extent provided in the award. This restriction does not limit the government’s right to use or disclose data obtained without restriction from any source, including the applicant.”

To protect such data, each line or paragraph on the pages containing such data must be specifically identified and marked with a legend similar to the following:

“The following contains proprietary information that (name of applicant) requests not be released to persons outside the Government, except for purposes of review and evaluation.”

E. **EVALUATION AND ADMINISTRATION BY NON-FEDERAL PERSONNEL.**
In conducting the merit review evaluation, the Government may seek the advice of qualified non-Federal personnel as reviewers. The Government may also use non-Federal personnel to conduct routine, nondiscretionary administrative activities. The applicant, by submitting its application, consents to the use of non-Federal reviewers/administrators. Non-Federal reviewers must sign conflict of interest and non-disclosure agreements prior to reviewing an application. Non-Federal personnel conducting administrative activities must sign a non-disclosure agreement.

F. **INTELLECTUAL PROPERTY DEVELOPED UNDER THIS PROGRAM. N/A**

G. **NOTICE OF RIGHT TO REQUEST PATENT WAIVER. N/A**
H. **NOTICE REGARDING ELIGIBLE/INELIGIBLE ACTIVITIES.**

Eligible activities under this program include those which describe and promote the understanding of scientific and technical aspects of specific energy technologies, but not those which encourage or support political activities such as the collection and dissemination of information related to potential, planned or pending legislation.

APPENDICES/REFERNCE MATERIAL REFERENCE MATERIAL

Federal Assistance Reporting Checklist, DOE F 4600.2

U.S. Department of Energy
FEDERAL ASSISTANCE REPORTING CHECKLIST AND INSTRUCTIONS

1. Identification Number: TBD	2. Program/Project Title: 81.121 Global Nuclear Energy Partnership Readiness

3. Recipient:

4. Reporting Requirements:	Frequency	No. of Copies	Addresses
A. MANAGEMENT REPORTING			
☑ Progress Report	F	via Email	A B
☑ Special Status Report	A	via Email	A B
B. SCIENTIFIC/TECHNICAL REPORTING Reports/Products must be submitted with appropriate DOE F 241. The 241 forms are available at www.osti.gov/elink.) Report/Product — Form ☐ Final Scientific/Technical Report — DOE F 241.3 ☐ Conference papers/proceedings* — DOE F 241.3 ☐ Software/Manual — DOE F 241.3 ☐ Other (see special instructions) — DOE F 241.3 ** Scientific and technical conferences only*			A, B applies to any specified OSTI reports http://www.osti.gov/elink-2413 http://www.osti.gov/elink-2413 http://www.osti.gov/estsc/241-4pre.jsp
C. FINANCIAL REPORTING ☐ SF-269, Financial Status Report ☑ SF-269A, Financial Status Report (Short Form) ☐ SF-272, Federal Cash Transactions Report	F	via Email	A B
D. CLOSEOUT REPORTING			
☑ Patent Certification	F	via Email	A
☑ Property Certification	F	via Email	A
☐ Other			
E. OTHER REPORTING			
☐ Annual Indirect Cost Proposal			
☐ Annual Inventory of Federally Owned Property, if any			
☐ Other			

FREQUENCY CODES AND DUE DATES:

A - Within 5 calendar days after events or as specified

F - Final; 90 calendar days after expiration or termination of the award.

Y - Yearly; 90 days after the end of the reporting period.

S - Semiannually; within 30 days after end of reporting period.

Q - Quarterly; within 30 days after end of the reporting period.

5. Special Instructions:

See page 7

Federal Assistance Reporting Instructions (5/06)

A. MANAGEMENT REPORTING

Progress Report

The Progress Report must provide a concise narrative assessment of the status of work and include the following information and any other information identified under Special Instructions on the Federal Assistance Reporting Checklist:

1. The DOE award number and name of the recipient.

2. The project title and name of the project director/principal investigator.

3. Date of report and period covered by the report.

4. A comparison of the actual accomplishments with the goals and objectives established for the period and reasons why the established goals were not met.

5. A discussion of what was accomplished under these goals during this reporting period, including major activities, significant results, major findings or conclusions, key outcomes or other achievements. This section should not contain any proprietary data or other information not subject to public release. If such information is important to reporting progress, do not include the information, but include a note in the report advising the reader to contact the Principal Investigator or the Project Director for further information.

6. Cost Status. Show approved budget by budget period and actual costs incurred. If cost sharing is required break out by DOE share, recipient share, and total costs.

7. Schedule Status. List milestones, anticipated completion dates and actual completion dates. If you submitted a project management plan with your application, you must use this plan to report schedule and budget variance. You may use your own project management system to provide this information.

8. Any changes in approach or aims and reasons for change. Remember significant changes to the objectives and scope require prior approval by the contracting officer.

9. Actual or anticipated problems or delays and actions taken or planned to resolve them.

10. Any absence or changes of key personnel or changes in consortium/teaming arrangement.

11.

A description of any product produced or technology transfer activities accomplished during this reporting period, such as:

A. Publications (list journal name, volume, issue); conference papers; or other public releases of results. Attach or send copies of public releases to the DOE Project Officer identified in Block 11 of the Notice of Financial Assistance Award.

B. Web site or other Internet sites that reflect the results of this project.

C. Networks or collaborations fostered.

D. Technologies/Techniques.

E. Inventions/Patent Applications

F. Other products, such as data or databases, physical collections, audio or video, software or netware, models, educational aid or curricula, instruments or equipment.

Special Status Report

The recipient must report the following events by e-mail as soon as possible after they occur:

1. Developments that have a significant favorable impact on the project.

2. Problems, delays, or adverse conditions which materially impair the recipient's ability to meet the objectives of the award or which may require DOE to respond to questions relating to such events from the public. The recipient must report any of the following incidents and include the anticipated impact and remedial action to be taken to correct or resolve the problem/condition:

   a. Any single fatality or injuries requiring hospitalization of five or more individuals.

   b. Any significant environmental permit violation.

   c. Any verbal or written Notice of Violation of any Environmental, Safety, and Health statutes.

   d. Any incident which causes a significant process or hazard control system failure.

   e. Any event which is anticipated to cause a significant schedule slippage or cost increase.

   f. Any damage to Government-owned equipment in excess of $50,000.

   g. Any other incident that has the potential for high visibility in the media.

B. SCIENTIFIC/TECHNICAL REPORTS

Final Scientific/Technical Report

Content. The final scientific/technical report must include the following information and any other information identified under Special Instructions on the Federal Assistance Reporting Checklist:

1. Identify the DOE award number; name of recipient; project title; name of project director/principal investigator; and consortium/teaming members.

2. Display prominently on the cover of the report any authorized distribution limitation notices, such as patentable material or protected data. Reports delivered without such notices may be deemed to have been furnished with unlimited rights, and the Government assumes no liability for the disclosure, use or reproduction of such reports.

3. Provide an executive summary, which includes a discussion of 1) how the research adds to the understanding of the area investigated; 2) the technical effectiveness and economic feasibility of the methods or techniques investigated or demonstrated; or 3) how the project is otherwise of benefit to the public. The discussion should be a minimum of one paragraph and written in terms understandable by an educated layman.

4. Provide a comparison of the actual accomplishments with the goals and objectives of the project.

5. Summarize project activities for the entire period of funding, including original hypotheses, approaches used, problems encountered and departure from planned methodology, and an assessment of their impact on the project results. Include, if applicable, facts, figures, analyses, and assumptions used during the life of the project to support the conclusions.

6. Identify products developed under the award and technology transfer activities, such as:

   a. Publications (list journal name, volume, issue), conference papers, or other public releases of results. If not provided previously, attach or send copies of any public releases to the DOE Project Officer identified in Block 11 of the Notice of Financial Assistance Award;

   b. Web site or other Internet sites that reflect the results of this project;

   c. Networks or collaborations fostered;

   d. Technologies/Techniques;

   e. Inventions/Patent Applications, licensing agreements; and

   f. Other products, such as data or databases, physical collections, audio or video, software or netware, models, educational aid or curricula, instruments or equipment.

7. For projects involving computer modeling, provide the following information with the final report:

   a. Model description, key assumptions, version, source and intended use;

   b. Performance criteria for the model related to the intended use;

   c. Test results to demonstrate the model performance criteria were met (e.g., code verification/validation, sensitivity analyses, history matching with lab or field data, as appropriate);

   d. Theory behind the model, expressed in non-mathematical terms;

   e. Mathematics to be used, including formulas and calculation methods;

f. Whether or not the theory and mathematical algorithms were peer reviewed, and, if so, include a summary of theoretical strengths and weaknesses;

g. Hardware requirements; and

h. Documentation (e.g., users guide, model code).

Electronic Submission. The final scientific/technical report must be submitted electronically via the DOE Energy Link System (E-Link) accessed at http://www.osti.gov/elink-2413.

Electronic Format. Reports must be submitted in the ADOBE PORTABLE DOCUMENT FORMAT (PDF) and be one integrated PDF file that contains all text, tables, diagrams, photographs, schematic, graphs, and charts. Materials, such as prints, videos, and books, that are essential to the report but cannot be submitted electronically, should be sent to the Contracting Officer at the address listed in Block 12 of the Notice of Financial Assistance Award.

Submittal Form. The report must be accompanied by a completed electronic version of DOE Form 241.3, "U.S. Department of Energy (DOE), Announcement of Scientific and Technical Information (STI)." You can complete, upload, and submit the DOE F.241.3 online via E-Link. You are encouraged not to submit patentable material or protected data in these reports, but if there is such material or data in the report, you must: (1) clearly identify patentable or protected data on each page of the report; (2) identify such material on the cover of the report; and (3) mark the appropriate block in Section K of the DOE F 241.3. Reports must not contain any limited rights data (proprietary data), classified information, information subject to export control classification, or other information not subject to release. Protected data is specific technical data, first produced in the performance of the award that is protected from public release for a period of time by the terms of the award agreement.

Conference Papers/Proceedings

Content: The recipient must submit a copy of any conference papers/proceedings, with the following information: (1) Name of conference; (2) Location of conference; (3) Date of conference; and (4) Conference sponsor.

Electronic Submission. Scientific/technical conference paper/proceedings must be submitted electronically via the DOE Energy Link System (E-Link) at http://www.osti.gov/elink-2413. Non-scientific/technical conference papers/proceedings must be sent to the URL listed on the Reporting Checklist.

Electronic Format. Conference papers/proceedings must be submitted in the ADOBE PORTABLE DOCUMENT FORMAT (PDF) and be one integrated PDF file that contains all text, tables, diagrams, photographs, schematic, graphs, and charts. If the proceedings cannot be submitted electronically, they should be sent to the DOE Administrator at the address listed in Block 12 of the Notice of Financial Assistance Award.

Submittal Form. Scientific/technical conference papers/proceedings must be accompanied by a completed DOE Form 241.3. The form and instructions are available on E-Link at http://www.osti.gov/elink-2413. This form is not required for non-scientific or non-technical conference papers or proceedings.

Software/Manual

Content. Unless otherwise specified in the award, the following must be delivered: source code, the executable object code and the minimum support documentation needed by a competent user to understand and use the software and to be able to modify the software in subsequent development efforts.

Electronic Submission. Submissions may be submitted electronically via the DOE Energy Link System (E-Link) at http://www.osti.gov/estsc/241-4pre.jsp. They may also be submitted via regular mail to:

Energy Science and Technology Software Center
P.O. Box 1020
Oak Ridge, TN 37831

Submittal Form. Each software deliverable and its manual must be accompanied by a completed DOE Form 241.4 "Announcement of U.S. Department of Energy Computer Software." The form and instructions are available on E-Link at http://www.osti.gov/estsc/241-4pre.jsp.

C. FINANCIAL REPORTING

Recipients must complete the financial reports identified on the Reporting Checklist in accordance with the report instructions. These standard forms are available at http://www.whitehouse.gov/omb/grants/index.html. Fillable forms are available at http://grants.pr.doe.gov.

D. CLOSEOUT REPORTS

Final Invention and Patent Report

The recipient must provide a DOE Form 2050.11, "PATENT CERTIFICATION." This form is available at http://www.directives.doe.gov/pdfs/forms/2050-11.pdf and http://grants.pr.doe.gov.

Property Certification

The recipient must provide the Property Certification, including the required inventories of non-exempt property, located at http://grants.pr.doe.gov.

E. OTHER REPORTING

Annual Indirect Cost Proposal and Reconciliation

Requirement. In accordance with the applicable cost principles, the recipient must submit an annual indirect cost proposal, reconciled to its financial statements, within six months after the close of the fiscal year, unless the award is based on a predetermined or fixed indirect rate(s), or a fixed amount for indirect or facilities and administration (F&A) costs.

Cognizant Agency. The recipient must submit its annual indirect cost proposal directly to the cognizant agency for negotiating and approving indirect costs. If the DOE awarding office is the cognizant agency, submit the annual indirect cost proposal to the DOE Award Administrator identified in Block 12 of the Notice of Financial Assistance Award.

Annual Inventory of Federally Owned Property

Requirement. If at any time during the award the recipient is provided Government-furnished property or acquires property with project funds and the award specifies that the property vests in the Federal Government (i.e. federally owned property), the recipient must submit an annual inventory of this property to the DOE Award Administrator identified in Block 12 of the Notice of Financial Assistance Award no later than October 30th of each calendar year, to cover an annual reporting period ending on the preceding September 30th.

Content of Inventory. The inventory must include a description of the property, tag number, acquisition date, location of property, and acquisition cost, if purchased with project funds. The report must list all federally owned property, including property located at subcontractor's facilities or other locations.

F. SPECIAL INSTRUCTIONS

Your performance in providing on-time report deliverables will be monitored by Procurement Services Division (PSD), Idaho Operations Office, Department of Energy. Reports not received by the specified due date are late. Overdue, inaccurate, or non-conforming reports are not acceptable. PSD will withhold payments or take other administrative actions as needed for non-compliance with reporting requirements (see 10 CFR 600.24). Only the Contracting Officer may waive or excuse required reports.

In order for accurate logging and processing of reports, it is critical that reports be sent to all the specified addressees and in the manner requested. PSD receives a copy of all reports via psdrept@id.doe.gov. The message subject line must include the award number.

Message Subject Line Example: DE-FC07-02ID99999, 4Q SF 269A Report.

The official award number must also be identified on all reports. A project number, if assigned by the program manager, may also be included, but is not a substitute for the official award number.

Report forms and additional report submittal guidance may be found on PSD's Internet web site at http://www.id.doe.gov/doeid/psd/proc-div.html. General guidance, in a question and answer format, is listed under "FA Report Submittal Guidance."

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REPORT ADDRESSEES

A. Procurement Services Divsion (PSD): psdrept@id.doe.gov
B. DOE Project Manager:
C. DOE Headquarters' Program Manager:
cc: Headquarters' Technical Monitor:

(End of Part IV)

FINANCIAL ASSISTANCE
FUNDING OPPORTUNITY ANNOUNCEMENT

U.S. Department of Energy

Idaho Operations Office

Nuclear Energy Research Initiative for Consortia (NERI-C)

Funding Opportunity Number: **DE-PS07-07ID14812**

Announcement Type: **Initial**

CFDA Number: **81.121**

Issue Date: **03/29/2007**

Application Due Date: **05/23/2007** at 11:59:59 PM Eastern Time

This announcement will remain open until the Application Due Date. Applications may be submitted any time before the announcement closes.

NOTE: REQUIREMENTS FOR GRANTS.GOV

Where to Submit: Applications must be submitted through Grants.gov to be considered for award. You cannot submit an application through Grants.gov unless you are registered. Please read the registration requirements carefully and start the process immediately. Remember you have to update your CCR registration annually. If you have any questions about your registration, you should contact

the Grants.gov Helpdesk at 1-800-518-4726 to verify that you are still registered in Grants.gov.

Registration Requirements: There are several one-time actions you must complete in order to submit an application through Grants.gov (e.g., obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number, register with the Central Contract Registry (CCR), register with the credential provider, and register with Grants.gov). See www.grants.gov/GetStarted. Use the Grants.gov Organization Registration Checklist at http://www.grants.gov/assets/OrganizationRegCheck.doc to guide you through the process. Designating an E-Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in the CCR registration process. Applicants, who are not registered with CCR and Grants.gov, should allow at least 21 days to complete these requirements. It is suggested that the process be started as soon as possible.

IMPORTANT NOTICE TO POTENTIAL APPLICANTS: When you have completed the process, you should call the Grants.gov Helpdesk at 1-800-518-4726 to verify that you have completed the final step (i.e. Grants.gov registration).

Questions: Questions relating to the registration process, system requirements, how an application form works, or the submittal process must be directed to Grants.gov at 1-800-518-4726 or support@grants.gov. Part VII of this announcement explains how to submit other questions to the U.S. Department of Energy.

Application Receipt Notices

After an application is submitted, the Authorized Organization Representative (AOR) will receive a series of five e-mails. It is extremely important that the AOR watch for and save each of the e-mails. It may take up to two (2) business days from application submission to receipt of e-mail Number 2. When the AOR receives e-mail Number 5, it is their responsibility to follow the instructions in the e-mail to logon to IIPS and verify that their application was received by DOE. The titles of the five e-mails are:

Number 1 - Grants.gov Submission Receipt Number
Number 2 - Grants.gov Submission Validation Receipt for Application Number
Number 3 - Grants.gov Grantor Agency Retrieval Receipt for Application Number
Number 4 - Grants.gov Agency Tracking Number Assignment for Application Number
Number 5 - DOE e-Center Grant Application Received

The last e-mail will contain instructions for the AOR to register with the DOE e-Center. If the AOR is already registered with the DOE e-Center, the title of the last e-mail changes to:

Number 5 - DOE e-Center Grant Application Received and Matched

This e-mail will contain the direct link to the application in IIPS. The AOR will need to enter their DOE e-Center user id and password to access the application.

TABLE OF CONTENTS

PART I – FUNDING OPPORTUNITY DESCRIPTION

Background:

For nearly 10 years, the U.S. Department of Energy (DOE) has had two major programs to provide support to universities: University Programs and the Nuclear Energy Research Initiative (NERI). Since 1998, University Programs has provided funding in areas such as reactor equipment upgrades, nuclear engineering research, reactor sharing, and graduate students/fellowships/assistanceships (hereafter referred to as "graduate students") and scholarships. The purposes of the program helped U.S. universities and colleges stay at the forefront of science education and research, by assisting universities in the operation of research reactors and in the performance of other educational activities. Under this program direct support was provided to educational institutions in 30 states and territories.

Since 1999, the Nuclear Energy Research Initiative (NERI) program has sponsored research to advance the state of nuclear science and technology in the United States by addressing the key technical issues impacting the expanded use of nuclear energy. The program sponsored research and development on next-generation nuclear energy systems; proliferation resistant nuclear fuel cycle technologies; generation of hydrogen using nuclear power; improvements in light water reactor technology; and fundamental areas of nuclear science that directly impact the long-term success of nuclear energy. The advances in these areas are expected to be incorporated in potential future advanced reactor designs and nuclear fuel systems. Further highlights of the NERI program are contained under the Nuclear Energy Research Initiative on the Office of Nuclear Energy's website (http://www.nuclear.gov).

In fiscal year 2007 (FY 07), the Department combined the elements of the University Program into the Nuclear University Research Initiative (NERI). The NERI program focuses on advanced nuclear research at the Nation's universities that integrates into the Department's mainline nuclear energy research and development (R&D) programs. The R&D conducted under NERI will directly support the Advanced Fuel Cycle R&D Program, under the Global Nuclear Energy Partnership (GNEP) initiative, the Generation IV Nuclear Energy Systems Initiative (Generation IV), and the Nuclear Hydrogen Initiative (NHI). This funding opportunity announcement (FOA), which is open to all U.S. colleges and universities and State-owned research institutions (hereby known as university/universities), provides an opportunity for universities to participate in these research initiatives. The NERI Research & Development (R&D) projects will be selected using a competitive, peer-reviewed process.

The NERI program is intended to support R&D to meet the following objectives:

- Directly support the resolution of technical and scientific issues for the Advanced Fuel Cycle R&D Program/GNEP, the Generation IV Nuclear Energy Systems Initiative, and Nuclear Hydrogen Initiative programs;
- Integrate the Nation's universities into the Department of Energy's mainline nuclear R&D programs;
- Contribute to assuring a new generation of engineers and scientists for the nuclear future.
- Provide "Capabilities Support" to universities so the needed educational and research components, including equipment, students, and outreach, are supported so world-class research can continue at U.S. university campuses.

The NERI program will have announcements in two areas: one for Consortia and one for Individual Principal Investigators. In FY07, only this one announcement will be issued under the NERI for Consortia. Individual Principal Investigators will receive research funding in FY07 under the former Nuclear Engineering Education Research (NEER) and NERI programs. It is anticipated that the new NERI program will issue two announcements in FY-08 in both the Consortia and Individual Principal Investigator areas.

STATEMENT OF OBJECTIVES: The Department of Energy (DOE) is seeking applications from university consortia for research and development (R&D) that will directly support its nuclear energy R&D. A consortium is considered to have, at a minimum, a grouping of at least three institutions, set up for the common purpose that would be beyond the capabilities of a single member of the group. It is anticipated that awarding to consortia will facilitate and encourage sharing of resources and facilities available to perform the various portions of the applicable scope by participating consortia members. It is expected that this will facilitate upgrading and sharing of laboratory and reactor equipment of the various consortia

members; improve support to students; enhance synergies by partnering with non-traditional institutions such as Historically Black Colleges and Universities and/or Hispanic-Serving Institutions; enhance the quality and nature of the commitments to student recruitment and retention, faculty development, and facility enhancements for such programs. Use of consortia should result in needed university resources being included so world-class research can continue to occur at consortia universities, including such related areas such as radiochemistry and health physics; and provide for outreach opportunities with the public with the purpose of educating others on nuclear research. By supporting consortia teams, the NERI program complements other DOE research programs that support traditional, single-investigator university research. NERI consortia awards can provide greater sustained support than single-investigator awards for the education and training of students pursuing advanced degrees in science and engineering fields critical to DOE and for associated infrastructure, such as research instrumentation. The DOE's nuclear energy R&D that will be supported include the Advanced Fuel Cycle R&D Program under the Global Nuclear Energy Partnership (GNEP) initiative, Generation IV Nuclear Energy Systems Initiative, and Nuclear Hydrogen Initiative. Information describing these programs, including detailed program and R&D plans, may be found on the Office of Nuclear Energy website, http://www.nuclear.gov. These three programs are organized into the following elements:

1. Advanced Fuel Cycle R&D Program/GNEP

1.1 Spent Fuel Separations Technology
1.2 Advanced Nuclear Fuel Development
1.3 Transmutation Engineering Technologies
1.4 Advanced Fuel Cycle Systems Analysis
1.5 Small and Medium-Sized Export Reactors

2. Generation IV Nuclear Energy Systems Initiative

2.1 Very-High-Temperature Reactor
2.2 Sodium Fast Reactor
2.3 Design and Evaluation Methods Development
2.4 Crosscutting Materials Development for Advanced Reactors
2.5 Energy Conversion

3. Nuclear Hydrogen Initiative

3.1 Thermochemical Cycles
3.2 High-Temperature Electrolysis
3.3 Reactor-Hydrogen Production Process Interface

NOTE: If any proposed project involves use of the Advanced Test Reactor (ATR) for testing, experimentation, etc., all investigators for the project who would be working at the ATR must be U.S. citizens.

A summary of the R&D needs in each of these program elements follows. More specific descriptions of representative R&D requests in these program elements are included in Appendix I. Proposed projects may involve work in any activity of these program elements.

1. Advanced Fuel Cycle Research and Development Program

Initiation of the DOE activities to realize the President’s Global Nuclear Energy Partnership (GNEP) vision marks a major change in the direction of the DOE’s R&D program on advanced fuel cycles. The Department is implementing a coherent plan to test technologies that promise to markedly reduce the problem of nuclear waste treatment and to reduce the proliferation risk in a world with a greatly expanded nuclear power program. GNEP brings the U.S. program into much closer alignment with that of the other major nuclear energy states.

GNEP proposes to take spent fuel from existing light water reactors (LWRs), separate the transuranic elements that are the main components contributing to repository problems and to proliferation concerns, and destroy them through multiple recycles in fast-spectrum reactors (FRs). GNEP builds on the technology developed over the past five years for efficiently separating the main components of spent reactor fuel into uranium that can be easily disposed of, fission fragments of relatively short lifetimes, and the plutonium and other transuranic elements that generate both the waste isolation and potential proliferation problems. It is a bold program that has a high expectation of success, but will require twenty or more years to fully evaluate its promise. Under GNEP three major technology projects are envisioned to be conducted by DOE:

- A demonstration of LWR spent fuel separations to provide proliferation-resistant products
- A demonstration of advanced fuel transmutation in an Advanced Burner Reactor (ABR)
- Availability of an Advanced Fuel Cycle Facility (AFCF) to provide advanced transmutation fuel assemblies for qualification in the ABR and provide a long-term advanced fuel cycle R&D capability in the U.S.

Additionally, a program is being planned under GNEP for the development and demonstration of reactors that are suitable for deployment to developing countries that have limited grid capacities and support infrastructure.

These GNEP projects will also provide the capability of developing advanced instrumentation and monitoring to improve accountability of plutonium and other transuranic elements. Further, they will allow for long-term research and development including technical and cost-effective improvements to proliferation-resistant separations and fuel fabrication technologies. DOE will engage industry in these projects and will need to plan and conduct technology development to mature the designs and make them marketable. University participation could help in this process.

More detailed information on GNEP can be obtained from the web page, www.gnep.energy.gov, which includes among general information, GNEP strategic plan and fact sheets as well as a copy of the Administration's FY 2007 Advanced Fuel Cycle R&D Program budget submission to Congress.

Henceforth, the prime focus of the Advanced Fuel Cycle R&D effort will be to support GNEP by:

- Performing the R&D necessary to implement the above three major GNEP projects;
- Identifying and conducting the R&D that these projects will enable; as well as:
- Continuing R&D on alternative technologies to improve the primary GNEP technologies.

1.1 Spent Fuel Separations Technology: The separations technology development component of Advanced Fuel Cycle R&D Program involves the development of advanced methods for the chemical partitioning of spent nuclear fuel into constituents that can be (1) readily disposed of in waste forms, (2) recycled for transmutation and/or energy recovery in fast reactor systems, or (3) stored for future disposition (cesium and strontium). Such partitioning will ultimately require the construction of a large spent fuel treatment facility for processing the output of current and future thermal spectrum reactors, and this facility must incorporate the best available process technologies as well as state-of-the-art instrumentation for process monitoring/control and materials accountancy. There will also be special requirements for the recycling of spent fuel arising from fast spectrum burners that must be met in the future, utilizing advanced spent fuel treatment methods tailored to the unique fuel types of this reactor concept. Proposed projects may involve R&D in the areas of advanced aqueous separations, pyrochemical processing, engineered product storage, and spent fuel treatment facility design/process technology development.

1.2 Advanced Nuclear Fuel Development: This program element is primarily focused on conducting research and development activities for advanced fuels applicable to fast spectrum transmuter systems. The fuel forms of interest for fast spectrum transmuters include fertile (high uranium content), low-fertile (low uranium content) and non-fertile (no uranium content) compositions in ceramic, metal, oxide, and composite fuels and targets. The general research topics of interest cover wide-ranging areas of fuel modeling, fuel and target fabrication process development, characterization methods, in-pile and out-of-pile testing, advanced instrumentation for in-pile testing, advanced fuel matrix and cladding material development.

1.3 Transmutation Science and Engineering Technologies: Transmutation engineering provides critical R&D to support advanced fuel cycles. Transmutation is a process by which long-lived radioactive species, particularly actinides (but also certain fission products), are converted into short-lived nuclides by either fission or neutron capture and decay. By changing the decay timescale from millennia to hundreds of years, toxicity and heat load challenges to the U.S. geologic repository fall into the realm of well-known engineering practices, and thus become easier to solve with better certainty of success. Transmutation engineering physics activities are focused in the areas of nuclear data and code validation. Transmutation engineering materials activities are focused on the development and understanding of structural material performance under intense radiation and environmental conditions. Proposed projects may involve R&D in the areas of modeling of material behavior during irradiation (developing molecular dynamics atomistic potentials, performing kinetic lattice monte carlo calculations and predicting macroscale mechanical properties), material irradiation performance, material environmental performance, advanced, materials development for irradiation and corrosion resistance, Monte Carlo physics code development, and nuclear data measurements.

1.4 Advanced Fuel Cycle Systems Analysis: The role of systems analysis is to define requirements, and link the objectives, analyses and technology developments of the Advanced Fuel Cycle R&D program with current operating nuclear plants and future advanced technologies by providing the models, tools, and analyses needed to optimize deployment options and to understand their benefits and impacts. Systems analyses of reactors and processes also will be useful for establishing needs for new technologies. Such studies typically involve energy demand, material flows (both resources used and wastes generated), cost analyses and system comparisons and are ripe for innovative R&D in areas such as computer model development.

In the intermediate term, the top-level objective for systems analysis is to analyze spent fuel treatment and recycle options for current light water reactors to support a Secretarial recommendation on the technical need for a second repository between 2007 and 2010. High-level longer-term objectives for systems analysis include cost/benefit analyses of alternative systems and fuel cycles, with an eye to optimizing deployment strategies. In particular, deployment strategies need to consider trade-off options among economics, energy, environmental impacts, and nonproliferation benefits of integrated advanced reactor/fuel cycle systems, balanced by an understanding of their development costs and technology risks.

1.5 Small and Medium-Sized Export Reactors: The anticipated large-scale increase in the use of nuclear energy world-wide will result in the deployment of hundreds to thousands of reactors in scores of countries, including countries that will be initiating nuclear generating capacity for the first time. Many of these countries will not be able to accommodate the larger plants being offered currently, so new, smaller-sized systems must be developed. Also, systems that are especially robust and secure are needed to minimize safety and nuclear proliferation concerns. These requirements lead to advanced technology interests for fuels, materials, sensors and instrumentation, controls, and safeguards/physical protection. Also, innovative designs are encouraged that lend well to construction and operation in more remote locations with limited personnel skills and resources.

2. Generation IV Nuclear Energy Systems Initiative

The goal of the Generation IV Nuclear Energy Systems Initiative (Gen IV) is to address the fundamental research and development (R&D) issues necessary to establish the viability of next-generation nuclear energy system concepts. Successfully addressing the fundamental R&D issues of Generation IV system concepts that excel in safety, sustainability, cost-effectiveness, and proliferation-resistance will allow these advanced systems to be considered for future commercial development and deployment by the private sector.

In consideration of national priorities established in EPAct, the President’s Hydrogen and Advanced Energy Initiatives, and the DOE Strategic Plan, Gen IV program is focused on developing sodium-cooled fast reactor technologies that may be used to close the nuclear fuel cycle with GNEP and very-high temperature reactor technologies for use in the Next Generation Nuclear Plant to produce hydrogen and other energy

products. The Department will continue to monitor the international development of other Generation IV systems and participate where possible in collaborative research activities that may be advantageous to the United States.

2.1 Very-High-Temperature Reactor: DOE is conducting R&D on the Very-High Temperature Reactor (VHTR) concept for use in the Next Generation Nuclear Plant (NGNP) as a process heat source to drive both hydrogen and electricity production. The VHTR will be helium-cooled and graphite moderated operating within a thermal-neutron spectrum. The VHTR reactor core could be either a helium-cooled prismatic graphite block or a pebble bed core. The VHTR will use very-high-burnup, low-enriched uranium, TRISO-coated fuel, and have a projected plant design service life of 60 years.

The VHTR concept is considered to be the nearest-term reactor design that has the capability to efficiently produce hydrogen. The plant size, reactor thermal power, and core configuration will ensure passive decay heat removal without fuel damage or radioactive material releases during accidents.

The objectives of the NGNP Project are established in the Energy Policy Act of 2005. The near-term objective is to make technology selections for the reactor and hydrogen production system by 2011. The ultimate objective is to design, construct, and operate an NGNP demonstration plant by 2021. The NGNP will be fully licensed by the U.S. Nuclear Regulatory Commission and will be operated to demonstrate safe and economical nuclear-assisted production of hydrogen and electricity.

The DOE laboratories, led by the Idaho National Laboratory (INL), perform R&D that will be critical to the success of the NGNP, primarily in the areas of: high-temperature gas reactor fuels behavior; high-temperature materials qualification; design methods development and validation; hydrogen production technologies; and energy conversion.

The current R&D work is addressing fundamental issues that are relevant to a variety of possible VHTR designs. Appendix I describes the VHTR R&D planned and currently underway. Presently, DOE is in the process of completing pre-conceptual design studies that will be used to inform the specific R&D needs that will enable a 2011 decision on the future of the NGNP project. The DOE-funded hydrogen production and energy conversion technologies programs are described elsewhere in this document.

2.2 Sodium Fast Reactor: The sodium-cooled fast reactor (SFR) uses liquid sodium as the reactor coolant, allowing high power density at low coolant volume fraction. The primary system operates at near-atmospheric pressure with typical outlet temperatures of 500-550 degrees Celsius; at these conditions, conventional steel structural materials can be utilized, and a large margin to coolant boiling is maintained. The reactor unit can be arranged in a pool layout or a compact loop layout. A variety of fuel options are being considered for the SFR including metal alloy, oxide, and nitride. Plant sizes ranging from small modular systems to large monolithic reactors are considered.

The primary mission for the SFR is the effective management of high-level wastes and uranium resources. The transuranics (TRU), primarily Pu, Am, Np, and Cm, are the primary contributors to nuclear waste disposal challenges (e.g., long-term heat load, peak repository dose, and radiotoxicity). Thus, a critical goal of the GNEP advanced fuel cycle strategy is to exclude these materials from the final waste. The TRU are separated from spent fuel and recycled for transmutation into fission products with more amenable waste characteristics. This process is commonly called “actinide burning”.

In a fast spectrum, actinides are preferentially fissioned not transmuted into higher actinides. This implies that fast systems are more “efficient” in destroying actinides; and the generation rate of higher actinides is suppressed. Therefore, the SFR is the base technology for TRU recycle and destruction in the Advanced Burner Reactor fuel cycle component of the GNEP. For this mission, a critical SFR issue is the development and demonstration of economic and proliferation-resistant recycle processes.

With innovations to reduce capital cost and improve efficiency, the Generation IV SFR system promises to be a more attractive option for electricity production than previous and existing prototype sodium-cooled fast reactors. The Generation IV Technology Roadmap ranked the SFR highly for sustainability because the

closed fuel cycle significantly improves the utilization of natural uranium. The SFR is also highly rated for safety performance. Bounding transient events are accommodated by inherent system responses and/or passive measures.

The SFR has the highest technical maturity level among Generation IV systems; its development approach builds on technologies already developed and demonstrated for sodium-cooled reactors and associated fuel cycles in fast reactor programs worldwide. The majority of the R&D needs that remain for the SFR reactor technology are related to performance rather than viability of the system. The Generation IV SFR system research plan includes work on SFR design and safety, advanced fuels, and component design and balance-of-plant; some specific tasks are highlighted in Appendix I.

2.3 Design and Evaluation Methods Development: The development of Generation IV systems requires modeling and simulation capabilities that provide accurate predictions of system performance. Viability of new technologies and design features will require confirmation by credible analyses verified with experimental data. The need to confirm performance advances relative to current generation systems creates a strong incentive to reduce modeling uncertainties that necessitate conservatism in design (which limit performance gains) or potentially costly efforts to improve upon the capabilities of available technologies. Credible analyses will also be required as the basis for regulatory reviews and licensing.

The objectives of the Generation IV research on Design and Evaluation Methods (D&EM) are to:

- Enable cost-effective verification of system viability and development of high-performance system designs by providing capabilities for system analysis, safety enhancement, and performance optimization.
- Provide methodologies for measuring the performance of Generation IV systems against Generation IV technology goals.
- Support R&D prioritization based on results of system design analyses and performance evaluations.
- Form the groundwork for safety review, licensing and regulation of Generation IV systems.

2.4 Crosscutting Materials Development for Advanced Reactors: An integrated R&D program will be conducted to study, quantify, and in some cases, develop materials with required properties for the Generation IV advanced reactor systems. The goal of the National Materials Program is to ensure that the required materials R&D will be a comprehensive and integrated effort to identify and provide the materials data and its interpretation needed for establishing the viability of concept, design, and construction of the advanced reactor concepts being pursued within DOE's Generation IV Program.
For the range of service conditions expected in Generation IV systems, including possible accident scenarios, sufficient data must be developed to demonstrate that the candidate materials meet the following design objectives: acceptable dimensional stability including void swelling, thermal creep, irradiation creep, stress relaxation, and growth; acceptable strength, ductility, and toughness; acceptable resistance to creep rupture, fatigue cracking, creep-fatigue interactions, and helium embrittlement; and acceptable chemical compatibility and corrosion resistance (including stress corrosion cracking and irradiation-assisted stress corrosion cracking) in the presence of coolants and process fluids.

Additionally, it will be necessary to develop validated models of microstructure-property relationships to enable predictions of long-term materials behavior to be made with confidence and to develop high-temperature materials design methodology for materials, use, codification, and regulatory acceptance.

2.5 Energy Conversion: Generation IV Energy Conversion work focuses development on more efficient or lower-cost electrical conversion technologies for the outlet temperature ranges of interest to Generation IV reactors. Generation IV reactor concepts will have higher output temperatures ranging from 500 C for the sodium cooled fast reactor concepts to up to 950 C for the VHTR. For these higher outlet temperatures, Brayton cycles using inert or other gas working fluids are promising conversion technologies. Current R&D focuses on development of the supercritical-CO2 cycle for the intermediate temperature systems (500 to 700 C). Studies also address helium Brayton cycles for the VHTR.

The supercritical-CO2 cycle research area includes:

- turbomachinery design studies to identify any unique turbomachinery issues;
- power conversion system configuration and preliminary cost studies;
- system control studies to develop control approaches and understand stability issues; and
- design studies to define small-scale experiments for demonstration of the key technologies.

Supercritical-CO2 work in the FY07 and FY08 will focus on construction and operation of small-scale supercritical compressor studies and design studies for small scale split-flow supercritical CO2 power conversion systems to evaluate control and stability issues.

Energy Conversion activities for the high-temperature Brayton systems focus on thermodynamic analyses and plant configuration studies to assess a range of options for improvements in cycle efficiency or conversion system cost.

3. Nuclear Hydrogen Initiative

The Nuclear Hydrogen Initiative (NHI) funds research and development activities to identify and demonstrate nuclear-based hydrogen production technologies to develop alternatives to meet future needs for increased hydrogen consumption. Due to high operating temperatures and improved efficiencies, both liquid metal systems (SFR) and gas cooled reactors (VHTR) are candidates for large scale hydrogen production. In accordance with the Energy Policy Act of 2005, the Department will select by 2011 the hydrogen production technology to be coupled with the Next Generation Nuclear Plant. The Nuclear Hydrogen Initiative is using a series of successively larger-scale experiments to inform that selection and eventually demonstrate the commercial-scale, economically-feasible production of hydrogen using nuclear energy

Projects proposed on these technologies should not duplicate research and development activities being pursued by the other DOE Hydrogen Program offices – Energy Efficiency and Renewable Energy, Fossil Energy, and Science. Information on the research being conducted by these offices can be found at http://www.hydrogen.energy.gov/.

Applications for Nuclear Hydrogen Initiative projects must define, to some level of detail, what steps will be taken to ensure safe handling, etc., and a commitment to provide a more detailed action plan within 60 days after award. This requirement is further defined in a Safety Requirements Document at http://www.eere.energy.gov/hydrogenandfuelcells/pdfs/safety_guidance.pdf).

3.1 Thermochemical Cycles: DOE is investigating the use of thermochemical cycles for hydrogen production using high temperature advanced nuclear reactors. Thermochemical cycles involve a series of chemical reactions that produce hydrogen from water at lower temperatures than direct thermal dissociation of water. High temperature advanced reactors will provide the heat for the endothermic chemical reactions. This task area will focus on the development of thermochemical cycles suitable for coupling to a high temperature nuclear reactor. Analytic and lab scale experimental studies will be performed for the sulfur-iodine and hybrid sulfur cycles to evaluate cycle performance and viability for use with nuclear energy. Analytic studies will also investigate several promising alternative cycles that may have potential for use with nuclear reactors, and lab scale experimental work will be initiated where appropriate. Flowsheet analyses will be performed to identify promising approaches, and lab-scale experiments will confirm technical feasibility and performance potential. For selected processes, pilot-scale systems will be constructed and operated to demonstrate efficiency and performance, and engineering scale systems will subsequently be constructed to demonstrate economically viable hydrogen production using nuclear heat.

3.2 High Temperature Electrolysis: This element of NHI focuses on developing components and overall designs for splitting steam into hydrogen and oxygen using high-temperature solid-oxide electrolyzer cells (SOECs). The technology is derived from the materials and configurations now used in solid oxide fuel cells (SOFCs) which use hydrogen to generate electricity. At the 750-900 C operating temperatures of SOECs, about 30% of the energy for electrolysis is supplied thermally, increasing the overall efficiency of the process to about 45%. The high-temperature electrolysis (HTE) project has conducted stack experiments using up to 120 cells for durations of 1000 and 2040 hours to investigate the thermal and electrical

performance of both the electrolyte and the interconnection plates. An integrated laboratory-scale experiment consisting of three modules of 240 cells each is being constructed in FY 2007 for operation in FY 2008 to further test control and long-term operation issues.

In addition, the project is developing conceptual designs for the series of experiments needed to demonstrate the concept on a commercial scale when attached to a 600-MWth VHTR. Besides the cells themselves, this design activity is determining requirements for electrical power control, steam-hydrogen separations and hydrogen and oxygen cooling. Finally, the project is investigating methods for reducing the overall costs of hydrogen production through HTE. An engineering process model has been developed to investigate the behavior of a full-scale HTE plant under various operating conditions.

3.3 Reactor-Hydrogen Production Process Interface: The System Interface and Support Systems activity consists of three interdependent areas of responsibility. These areas and their associated boundary assumptions are:

1) Reactor/Process Interface – The coupling of a high-temperature nuclear reactor to a hydrogen production plant is an area of critical importance to the development of nuclear hydrogen capabilities and is the primary focus of the Systems Interface research area in the near term. These studies include analysis of intermediate heat transfer loops between the reactor heat source and the hydrogen process plant. Innovative heat exchanger designs and the associated materials requirements, understanding the implications of system or component failures, and process simulation and control are areas of current research and development.

2) Balance of Plant (BOP) – Balance of plant encompasses all components and systems of the hydrogen production plant that do not directly perform or support the chemical or electrolysis processes involved in generating hydrogen. Examples are heat exchangers that do not provide direct reaction heat, product and byproduct handling systems, waste handling systems, off-gas treatment, water treatment systems, and sampling systems. BOP requirements may be highly dependent upon the specific hydrogen production process and operational conditions.

3) Process Infrastructure and Support Facilities – Process infrastructure includes facility requirements, electrical, non-electrical energy sources, support laboratories, machine shop, spare parts stores, bulking facilities for feedstock, byproducts and waste materials. Infrastructure requirements tend not to be highly dependent upon specific processes other than capacity.

The scope of the Systems Interface and Support Systems area is to ensure that all support systems and reactor interface issues and requirements are met and are ready to support the decision process as the different hydrogen generation processes mature towards the pilot and engineering scale decisions.

PART II – AWARD INFORMATION

A. TYPE OF AWARD INSTRUMENT.

DOE anticipates awarding grants under this program announcement.

B. ESTIMATED FUNDING.

Approximately $30,000,000 total ($10,000,000 per year) is expected to be available for new awards under this announcement, subject to the availability of funds.

C. MAXIMUM AND MINIMUM AWARD SIZE

Ceiling (i.e., the maximum amount for an individual award made under this announcement) $ 3,000,000

Floor (i.e., the minimum amount for an individual award made under this announcement) $ None

D. **EXPECTED NUMBER OF AWARDS.**
DOE anticipates making between 8 - 13 consortium awards under this announcement. A consortium is considered to involve, at a minimum, three institutions.

E. **ANTICIPATED AWARD SIZE**.
DOE expects to fund up to $1,000,000 per year for up to 3 years, subject to the availability of funds. If requested levels are higher, applicants must justify need for more funds consistent with the ceiling on individual awards described in paragraph C above.

F. **PERIOD OF PERFORMANCE.**
DOE anticipates making awards that will run for up to 3 years.

G. **TYPE OF APPLICATION.**
DOE will accept new and renewal applications under this announcement. Renewal applications are requests for additional funding for a period subsequent to that provided by a current award. Renewal applications compete with all other applications and must be submitted by any established due date/deadline or at least six months before additional funding is required if there is no specified due date/deadline. In preparing a renewal application, applicants should assume that reviewers will not have access to previous applications. The application should be developed as fully as though the applicant were applying for the first time. The application must include all the information required for a new project, plus the project narrative section should discuss the results from prior work.

PART III – ELIGIBILITY INFORMATION

A. **ELIGIBLE APPLICANTS.**
Applicant eligibility is restricted to U.S. colleges and universities, and State owned research institutions. Any collaborators to be funded under this announcement through the lead universities, or State owned research institutions, may be other U.S. universities, or FFRDCs. At least 80 percent of the requested funding must go to universities unless an adequate justification for a larger portion going to non-universities is provided.
NOTE: If any proposed project involves use of the Advanced Test Reactor (ATR) for testing, experimentation, etc., all investigators for the project who would be working at the ATR must be U.S. citizens.

B. **COST SHARING.**
Cost sharing is not required.

C. **OTHER ELIGIBILITY REQUIREMENTS.**
Federally Funded Research and Development Center (FFRDC) Contractors.

FFRDC contractors are not eligible for an award under this announcement, but they may be proposed as a team member on another entity's application subject to the following guidelines:

Authorization for non-DOE/NNSA FFRDCs. The Federal agency sponsoring the FFRDC contractor must authorize in writing the use of the FFRDC contractor on the proposed project and this authorization must be submitted with the application. The use of a FFRDC contractor must be consistent with the contractor's authority under its award and must not place the FFRDC contractor in direct competition with the private sector.

Authorization for DOE/NNSA FFRDCs. The cognizant contracting officer for the FFRDC must authorize in writing the use of a DOE/NNSA FFRDC contractor on the proposed project and this authorization must be submitted with the application. The following wording is acceptable for this authorization.

"Authorization is granted for the _____ Laboratory to participate in the proposed project. The work proposed for the laboratory is consistent with or complimentary to the missions of the laboratory, will not adversely impact execution of the DOE/NNSA assigned programs at the laboratory, and will not place the laboratory in direct competition with the domestic private sector."

Value/Funding. The value of, and funding for, the FFRDC contractor portion of the work will not normally be included in the award to a successful applicant. Usually, DOE/NNSA will fund a DOE/NNSA FFRDC contractor through the DOE field work proposal system and other FFRDC contractors through an interagency agreement with the sponsoring agency.

Cost Share. The applicant's cost share requirement will be based on the total cost of the project, including the applicant's and the FFRDC contractor's portions of the effort.

FFRDC Contractor Effort:

The FFRDC contractor effort, in aggregate, shall not exceed 20 % of the total estimated cost of the project, including the applicant's and the FFRDC contractor's portions of the effort.

Responsibility. The applicant, if successful, will be the responsible authority regarding the settlement and satisfaction of all contractual and administrative issues, including but not limited to, disputes and claims arising out of any agreement between the applicant and the FFRDC contractor.

PART IV – APPLICATION AND SUBMISSION INFORMATION

A. ADDRESS TO REQUEST APPLICATION PACKAGE.

Application forms and instructions are available at Grants.gov. To access these materials, go to http://www.grants.gov, select "Apply for Grants," and then select "Download Application Package." Enter the CFDA and/or the funding opportunity number located on the cover of this announcement and then follow the prompts to download the application package. NOTE: You will not be able to download the Application Package unless you have installed PureEdge Viewer (See: http://www.grants.gov/DownloadViewer).

B. LETTER OF INTENT AND PRE-APPLICATION.

1. Letter of Intent.

Letters of Intent are not required.

2. Pre-application.

Pre-applications are not required.

C. CONTENT AND FORM OF APPLICATION – SF 424 (R&R)

You must complete the mandatory forms and any applicable optional forms (e.g., SF-LLL- Disclosure of Lobbying Activities) in accordance with the instructions on the forms and the additional instructions below. **Files that are attached to the forms must be in Adobe Portable Document Format (PDF) unless otherwise specified in this announcement.**

1. SF 424 (R&R).

Complete this form first to populate data in other forms. Complete all the required fields in accordance with the pop-up instructions on the form. To activate the instructions, turn on the "Help Mode" (Icon with the pointer and question mark at the top of the form). The list of certifications and assurances

referenced in Field 18 can be found on the Applicant and Recipient Page at http://grants.pr.doe.gov, under Certifications and Assurances.

2. RESEARCH AND RELATED Other Project Information.
Complete questions 1 through 5 and attach files. The files must comply with the following instructions:

Project Summary/Abstract(Field 6 on the Form)
The project summary/abstract must contain a summary of the proposed activity suitable for dissemination to the public. It should be a self-contained document that identifies the name of the applicant, the project director/principal investigator(s), the project title, the objectives of the project, a description of the project, including methods to be employed, the potential impact of the project (i.e., benefits, outcomes), and major participants (for collaborative projects). This document must not include any proprietary or sensitive business information as the Department may make it available to the public. The project summary must not exceed 1 page when printed using standard 8.5" by 11" paper with 1" margins (top, bottom, left and right) with font not smaller than Arial 11 point. To attach a Project Summary/Abstract, click "Add Attachment."

Project Narrative(Field 7 on the Form)
The project narrative must not exceed 25 pages, including cover page, table of contents, charts, graphs, maps, photographs, and other pictorial presentations, when printed using standard 8.5" by 11" paper with 1 inch margins (top, bottom, left, and right). EVALUATORS WILL ONLY REVIEW THE NUMBER OF PAGES SPECIFIED IN THE PRECEDING SENTENCE. The font must not be smaller than Arial 11 point. Do not include any Internet addresses (URLs) that provide information necessary to review the application, because the information contained in these sites will not be reviewed. See Part VIII.D for instructions on how to mark proprietary application information. To attach a Project Narrative, click "Add Attachment."

The project narrative must include:
Project Objectives: This section should provide a clear, concise statement of the specific objectives/aims of the proposed project.
Merit Review Criterion Discussion. The section should be formatted to address each of the merit review criterion and sub-criterion listed in Section V. A. Provide sufficient information so that reviewers will be able to evaluate the application in accordance with these merit review criteria. DOE/NNSA WILL EVALUATE AND CONSIDER ONLY THOSE APPLICATIONS THAT ADDRESS SEPARATELY EACH OF THE MERIT REVIEW CRITERION AND SUB-CRITERION.
Evaluation Phase: This section must include a plan and metrics to be used to assess the success of the project.
Project Timetable: This section should outline as a function of time, year by year, all the important activities or phases of the project, including any activities planned beyond the project period. Successful applicants must use this project timetable to report progress.

Bibliography & References Cited Appendix
Provide a bibliography of any references cited in the Project Narrative. Each reference must include the names of all authors (in the same sequence in which they appear in the publication), the article and journal title, book title, volume number, page numbers, and year of publication. Include only bibliographic citations. Applicants should be especially careful to follow scholarly practices in providing citations for source materials relied upon when preparing any section of the application. In order to reduce the number of files attached to your application, please provide the Bibliography and References Cited information as an appendix to your project narrative. This appendix will not count in the project narrative page limitation.

Facilities & Other Resources Appendix
This information is used to assess the capability of the organizational resources, including subawardee resources, available to perform the effort proposed. Identify the facilities to be used

(Laboratory, Animal, Computer, Office, Clinical and Other). If appropriate, indicate their capacities, pertinent capabilities, relative proximity, and extent of availability to the project. Describe only those resources that are directly applicable to the proposed work. Describe other resources available to the project (e.g., machine shop, electronic shop) and the extent to which they would be available to the project. In order to reduce the number of files attached to your application, please provide the Facility and Other Resource information as an appendix to your project narrative. This appendix will not count in the project narrative page limitation.

Equipment Appendix
List major items of equipment already available for this project and, if appropriate identify location and pertinent capabilities. In order to reduce the number of files attached to your application, please provide the Equipment information as an appendix to your project narrative. This appendix will not count in the project narrative page limitation.

Do not attach files for fields 8, 9, and 10, instead follow the above instructions to include the information as appendices to the project narrative file.

Other Attachment Appendix (Field 11 on the form)
If you need to elaborate on your responses to questions 1-5 on the "Other Project Information" document, provide the information in a single file named "projinfo.pdf". Click on "Add Attachments in Field 11" to attach file.

Also, attach the following files:

Environmental Questionnaire
You must complete the environmental questionnaire at (see attachment to this funding opportunity announcement). Save the questionnaire in a single file named "Env.pdf" and click on "Add Attachments" in Field 11 to attach.

Project Management Plan
This plan should identify the activities/tasks to be performed, a time schedule for the accomplishment of the activities/tasks, the spending plan associated with the activities/tasks, and the expected dates for the release of outcomes. Applicants may use their own project management system to provide this information. This plan should identify any decision points and go/no-go decision criteria. Successful applicants must use this plan to report schedule and budget variances. Save this plan in a single file named "pmp.pdf" and click on "Add Attachments" in Field 11 to attach.

R&R Other Project Information: also include narrative that describes all consortia members' research and activities.

3. RESEARCH AND RELATED Senior/Key Person.
Complete this form before the Budget form to populate data on the Budget form. Beginning with the PD/PI, provide a profile for each senior/key person proposed. A senior/key person is any individual who contributes in a substantive, measurable way to the scientific/technical development or execution of the project, whether or not a salary is proposed for this individual. Subawardees and consultants must be included if they meet this definition. For each senior/key person provide:

Biographical Sketch:
Complete a biographical sketch for each senior/key person and attach to the "Attach Biographical Sketch" field in each profile. The biographical information for each person must not exceed 2 pages when printed on 8.5" by 11" paper with 1 inch margins (top, bottom, left, and right) with font not smaller than Arial 11 point and must include:

Education and Training. Undergraduate, graduate and postdoctoral training, provide institution, major/area, degree and year.

Research and Professional Experience: Beginning with the current position list, in chronological

order, professional/academic positions with a brief description.

Publications. Provide a list of up to 10 publications most closely related to the proposed project. For each publication, identify the names of all authors (in the same sequence in which they appear in the publication), the article title, book or journal title, volume number, page numbers, year of publication, and website address if available electronically.

Patents, copyrights and software systems developed may be provided in addition to or substituted for publications.

Synergistic Activities. List no more than 5 professional and scholarly activities related to the effort proposed.

Current and Pending Support.

Current and pending support information is not required for this program. Do not attach a Current and Pending Support file.

4. RESEARCH AND RELATED BUDGET Complete the Research and Related Budget form in accordance with the instructions on the form (Activate Help Mode to see instructions) and the following instructions. You must complete a separate budget for each year of support requested. The form will generate a cumulative budget for the total project period. You must complete all the mandatory information on the form before the NEXT PERIOD button is activated. You may request funds under any of the categories listed as long as the item and amount are necessary to perform the proposed work, meet all the criteria for allowability under the applicable Federal cost principles, and are not prohibited by the funding restrictions in this announcement (See PART IV, G).

Budget Justification (Field K on the form).

Provide the required supporting information for the following costs (See R&R Budget instructions): equipment; domestic and foreign travel; participant/trainees; material and supplies; publication; consultant services; ADP/computer services; subaward/consortium/contractual; equipment or facility rental/user fees; alterations and renovations; and indirect cost type. Provide any other information you wish to submit to justify your budget request. You must have a letter from each third party contributing cost sharing (i.e., a party other than the organization submitting the application) stating that the third party is committed to providing a specific minimum dollar amount of cost sharing. In the budget justification, identify the following information for each third party contributing cost sharing: (1) the name of the organization; (2) the proposed dollar amount to be provided; (3) the amount as a percentage of the total project cost; and (4) the proposed cost sharing – cash, services, or property. By submitting your application, you are providing assurance that you have signed letters of commitment. Successful applicants will be required to submit these signed letters of commitments.Attach a single budget justification file for the entire project period in Field K. The file automatically carries over to each budget year.

5. R&R SUBAWARD BUDGET ATTACHMENT(S) FORM

Budgets for Subawardees, other than DOE FFRDC Contractors. You must provide a separate cumulative R&R budget for each subawardee that is expected to perform work estimated to be more than $100,000 or 50 percent of the total work effort (whichever is less). Download the R&R Budget Attachment from the R&R SUBAWARD BUDGET ATTACHMENT(S) FORM and e-mail it to each subawardee that is required to submit a separate budget. Note: Subwardees must have installed PureEdge Viewer before they can complete the form. After the Subawardee has e-mailed its completed budget back to you, attach it to one of the blocks provided on the form. Use up to 10 letters of the subawardee's name (plus .xfd) as the file name (e.g., ucla.xfd or energyres.xfd).

6. SF-LLL Disclosure of Lobbying Activities

If applicable, complete SF- LLL. Applicability: If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or

employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the grant/cooperative agreement, you must complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying."

Summary of Required Forms/Files

Your application must include the forms from the application package and other documents as shown below.:

Name of Document	Format	Attach to
SF 424 (R&R)		N/A
Research & Related Other Project Information		N/A
Project Summary/Abstract	PDF	Field 6
Project Narrative, including required appendices	PDF	Field 7
Environmental Questionaire	PDF	Field 11
Project Management Plan	PDF	Field 11
Research & Related Senior/Key Person		N/A
Biographical Sketch	PDF	Appropriate block
Research & Related Budget (Total Fed & non-Fed)		N/A
Budget Justification	PDF	Field K
R&R Subaward Budget (Total Fed & non-Fed) Attachment (s) Form, if applicable		N/A
SF-LLL Disclosure of Lobbying Activities, if applicable.		N/A

D. **SUBMISSIONS FROM SUCCESSFUL APPLICANTS**.

If selected for award, DOE reserves the right to request additional or clarifying information for any reason deemed necessary, including, but not limited to:

a. Indirect cost information
b. Other budget information
c. Name and phone number of the Designated Responsible Employee for complying with national policies prohibiting discrimination (See 10 CFR 1040.5)
d. Representation of Limited Rights Data and Restricted Software, if applicable
e. Commitment Letter from Third Parties Contributing to Cost Sharing, if applicable
f. Successful applicants must submit the information listed in this section not later than 30 calendar days after notification of selection. Applicants who fail to provide the information within the required time period may be eliminated from further consideration.

   -For R&D programs, if applicable, and if the FFRDC budget was not submitted with the application, submit:

   --Budget for FFRDC participant, if any. If a non-DOE FFRDC contractor is approved to perform a portion of the work, provide a separate budget for the FFRDC contractor's work effort (a maximum of 20% of the total budget may be included if approval by the Contracting Officer is received). If a DOE FFRDC contractor is to perform a portion of the work, provide a DOE Field Work Proposal in accordance with the requirements in DOE Order 412.1 Work Authorization System (Attachment 3 is a Sample Format for the Field Work Proposal). DOE O 412.1 is available at http://www.directives.doe.gov/directives/current.html#number (Click on Series 400 Work Process).

E. **SUBMISSION DATES AND TIMES**

1. Pre-application Due Date.

Pre-applications are not required.

2. Application Due Date.

Applications should be received by 05/23/2007, 11:59:59 PM Eastern Time. You are encouraged to transmit your application well before the deadline. The Grants.gov Helpdesk is not available after 9:00

PM Eastern Time. APPLICATIONS RECEIVED AFTER THE DEADLINE WILL NOT BE REVIEWED OR CONSIDERED FOR AWARD.

F. INTERGOVERNMENTAL REVIEW

This program is not subject to Executive Order 12372 – Intergovernmental Review of Federal Programs.

G. FUNDING RESTRICTIONS.

Cost Principles. Costs must be allowable in accordance with the applicable Federal cost principles referenced in 10 CFR part 600. The cost principles for commercial organization are in FAR Part 31.

Pre-award Costs. Recipients may charge to an award resulting from this announcement pre-award costs that were incurred within the ninety (90) calendar day period immediately preceding the effective date of the award, if the costs are allowable in accordance with the applicable Federal cost principles referenced in 10 CFR part 600. Recipients must obtain the prior approval of the contracting officer for any pre-award costs that are for periods greater than this 90 day calendar period.

Pre-award costs are incurred at the applicant's risk. DOE is under no obligation to reimburse such costs if for any reason the applicant does not receive an award or if the award is made for a lesser amount than the applicant expected.

H. OTHER SUBMISSION AND REGISTRATION REQUIREMENTS

1. Where to Submit.

APPLICATIONS MUST BE SUBMITTED THROUGH GRANTS.GOV TO BE CONSIDERED FOR AWARD. Submit electronic applications through the "Apply for Grants" function at www.Grants.gov. If you have problems completing the registration process or submitting your application, call Grants.gov at 1-800-518-4726 or send an e-mail to support@grants.gov.

2. Registration Process.

You must COMPLETE the one-time registration process (all steps) before you may submit your first application through Grants.gov (See www.grants.gov/GetStarted. **We recommend that you start this process at least three weeks before the application due date.** It may take 21 days or more to complete the entire process. Use the Grants.gov Organizational Registration Checklists at http://www.grants.gov/assets/OrganizationRegCheck.doc to guide you through the process. IMPORTANT: During the CCR registration process, you will be asked to designate an E-Business Point of Contact (EBIZ POC). The EBIZ POC must obtain a special password called "Marketing Partner identification Number" (MPIN). When you have completed the process, you should call the Grants.gov Helpdesk at 1-800-518-4726 to verify that you have completed the final step (i.e. Grants.gov registration).

3. Application Receipt Notices.

After an application is submitted, the Authorized Organization Representative (AOR) will receive a series of five e-mails. It is extremely important that the AOR watch for and save each of the e-mails. It may take up to two (2) business days from application submission to receipt of e-mail Number 2. When the AOR receives email Number 5, it is their responsibility to follow the instructions in the email to logon to IIPS and verify that their application was received by DOE. You will need the Submission Receipt Number (e-mail Number 1) to track a submission. The titles of the five e-mails are:

Number 1 - Grants.gov Submission Receipt Number
Number 2 - Grants.gov Submission Validation Receipt for Application Number
Number 3 - Grants.gov Grantor Agency Retrieval Receipt for Application Number
Number 4 - Grants.gov Agency Tracking Number Assignment for Application Number
Number 5 - DOE e-Center Grant Application Received

The last e-mail will contain instructions for the AOR to register with the DOE e-Center. If the AOR is already registered

with the DOE e-Center, the title of the last e-mail changes to:

Number 5 - DOE e-Center Grant Application Received and Matched

This e-mail will contain the direct link to the application in IIPS. The AOR will need to enter their DOE e-Center user id and password to access the application.

Part V - APPLICATION REVIEW INFORMATION

A. CRITERIA

1. Initial Review Criteria.

Prior to a comprehensive merit evaluation, DOE will perform an initial review to determine that (1) the applicant is eligible for an award; (2) the information required by the announcement has been submitted; (3) all mandatory requirements are satisfied; and (4) the proposed project is responsive to the objectives of the funding opportunity announcement.

2. Merit Review Criteria.

a. Technical quality of the proposed work. (60%)

The contribution to the state of knowledge in the relevant program element(s) and applicable scope, including the significance of the proposed application(s) versus current practices should be well defined. The proposal should clearly present an understanding of current practices and deficiencies; the feasibility of an applicant's technology; benefits in terms of anticipated performance improvements; and cost savings of the proposed application(s) over current practices. The technical proposal should also clearly define what research is being performed by each consortia member and the relationship to the relevant program element(s).

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b. Principle Investigator and use of graduate students. (10%)

The proposal should clearly state the capabilities and qualifications of the principal investigator (s)/project manager(s) and key personnel by consortia member. The proposal should explain the relationship between the principal investigator(s)/project manager(s) and list graduate student candidates and how the prospective graduate student's academic credentials fit in the applicable scope. This portion of the proposal should also address the commitment to the graduate students.

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c. Adequacy of resources and facilities.(20%)

The proposal should clearly state the resources and facilities available to perform the various portions of the applicable scope by participating consortia members and how these resources and facilities will be shared among the consortia members. This portion of the proposal should cover the use of, and the upgrading and sharing of university reactors and laboratory and reactor equipment of the various consortia members; providing support to students; partnering with institutions who have prior or existing relationships with nuclear engineering universities, such as Historically Black Colleges and Universities and/or Hispanic-Serving Institutions.

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d. Capabilities and support. (10%)

The proposal should ensure needed university resources are included so world-class research can continue to occur at the university. This portion of the proposal should address support in related areas such as radiochemistry and health physics; and provide outreach activities for the public, with the purpose of continuing to educate and attract students to the disciplines of nuclear engineering.

3. Other Selection Factors.

a. Balanced portfolio of projects that represent a diversity of projects across the Advanced Fuel Cycle R&D Program/GNEP, Generation IV Nuclear Energy Systems Initiative, and Nuclear Hydrogen Initiative, and diversity in the makeup of the Consortia.

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b. Development of a consortium with significant participation from all members, including minority serving institutions. Significant participation is defined at a minimum as the smallest participation is at least 10% of the total funding going to the member receiving the most funding.

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c. Commitment to support student recruitment and retention, faculty development, and facility enhancements.

B. REVIEW AND SELECTION PROCESS.

1. Merit Review.

Applications that pass the initial review will be subjected to a merit review in accordance with the guidance provided in the "Department of Energy Merit Review Guide for Financial Assistance and Unsolicited Proposals." This guide is available under Financial Assistance, Regulations and Guidance at http://professionals.pr.doe.gov/ma5/ma-5web.nsf/?Open.

2. Selection.

The Selection Official will consider the merit review recommendation, program policy factors, and the amount of funds available.

3. Discussions and Award.

The Government may enter into discussions with a selected applicant for any reason deemed necessary, including but not limited to: (1) the budget is not appropriate or reasonable for the requirement; (2) only a portion of the application is selected for award; (3) the Government needs additional information to determine that the recipient is capable of complying with the requirements in 10 CFR part 600; and/or (4) special terms and conditions are required. Failure to resolve satisfactorily the issues identified by the Government will preclude award to the applicant.

C. ANTICIPATED NOTICE OF SELECTION AND AWARD DATES.

DOE anticipates notifying applicants selected for award by 07/10/2007 and making awards by 09/30/2007.

Part VI - AWARD ADMINISTRATION INFORMATION

A. AWARD NOTICES.

1. Notice of Selection.

DOE will notify applicants selected for award. This notice of selection is not an authorization to begin performance. (See Part IV.G with respect to the allowability of pre-award costs.)

2. Notice of Award.

A Notice of Financial Assistance Award issued by the contracting officer is the authorizing award document. It normally includes, either as an attachment or by reference: 1. Special Terms and Conditions; 2. Applicable program regulations, if any; 3. Application as approved by DOE.; 4. DOE assistance regulations at 10 CFR part 600, or, for Federal Demonstration Partnership (FDP) institutions, the FDP terms and conditions; 5. National Policy Assurances To Be Incorporated As Award Terms; 6. Budget Summary; and 7. Federal Assistance Reporting Checklist, which identifies the reporting requirements.

B. ADMINISTRATIVE AND NATIONAL POLICY REQUIREMENTS.

1. Administrative Requirements.

The administrative requirements for DOE grants and cooperative agreements are contained in 10 CFR part 600 (See: http://ecfr.gpoaccess.gov), except for grants made to Federal Demonstration Partnership (FDP) institutions. The FDP terms and conditions and DOE FDP agency specific terms and conditions are located on the National Science Foundation web site at http://www.nsf.gov/awards/managing/fed_dem_part.jsp.

2. Special Terms and Conditions and National Policy Requirements.

Special Terms and Conditions and National Policy Requirements.

The DOE Special Terms and Conditions for Use in Most Grants and Cooperative Agreements are located at http://grants.pr.doe.gov. The National Policy AssurancesTo Be Incorporated As Award Terms are located at http://grants.pr.doe.gov.

Intellectual Property Provisions.

The standard DOE financial assistance intellectual property provisions applicable to the various types of recipients are located at http://www.gc.doe.gov/techtrans/sipp_matrix.html.

C. **REPORTING.**

Reporting requirements are identified on the Federal Assistance Reporting Checklist, DOE F 4600.2, attached to the award agreement. See checklist included as Appendix II to this funding annoucement for the proposed Checklist for this program.

PART VII - QUESTIONS/AGENCY CONTACTS

A. **QUESTIONS**

Questions regarding the content of the announcement must be submitted through the "Submit Question" feature of the DOE Industry Interactive Procurement System (IIPS) at http://e-center.doe.gov. Locate the program announcement on IIPS and then click on the “Submit Question” button. Enter required information. You will receive an electronic notification that your question has been answered. DOE will try to respond to a question within 3 business days, unless a similar question and answer have already been posted on the website

Questions relating to the registration process, system requirements, how an application form works, or the submittal process must be directed to Grants.gov at 1-800-518-4726 or support@grants.gov. DOE cannot answer these questions.

Questions regarding the content of the announcement should be submitted through the “Submit Question” feature of the DOE Industry Interacitve Procurement System (IIPS) at http:/e-center.doe.gov. Locate the announcement on IIPS and then click on the “Submit Question” button. Enter required information. You will receive an electronic notification that your question has been answered. DOE/NNSA will try to respond to a question within 3 days, unless a similar question and answer have already been posted on the website. Responses to questions may be viewed through the “View Questions” feature, button. If no questions have been answered, a statement to that effect will appear. You should periodically check “View Questions” for new questions and answers.

Questions regarding how to submit questions or view responses can be e-mailed to the IIPSHELP Desk at helpdesk@pr.doe.gov or by calling 1 (800) 683-0751.

B. **Agency Contact**

Name: Eliot Dye

E-mail address: dyeej@id.doe.gov

Fax: (208) 526-5548

Telephone: (208) 526-9593

PART VIII - OTHER INFORMATION

A. **MODIFICATIONS.**

Notices of any modifications to this announcement will be posted on Grants.gov and the DOE

Industry Interactive Procurement System (IIPS). You can receive an e-mail when a modification or an announcement message is posted by joining the mailing list for this announcement through the link in IIPS. When you download the application at Grants.gov, you can also register to receive notifications of changes through Grants.gov.

B. **GOVERNMENT RIGHT TO REJECT OR NEGOTIATE.**
DOE reserves the right, without qualification, to reject any or all applications received in response to this announcement and to select any application, in whole or in part, as a basis for negotiation and/or award.

C. **COMMITMENT OF PUBLIC FUNDS.**
The Contracting Officer is the only individual who can make awards or commit the Government to the expenditure of public funds. A commitment by other than the Contracting Officer, either explicit or implied, is invalid.

D. **PROPRIETARY APPLICATION INFORMATION.**
Patentable ideas, trade secrets, proprietary or confidentional commercial or financial information, disclosure of which may harm the applicant, should be included in an application only when such information is necessary to convey an understanding of the proposed project. The use and disclosure of such data may be restricted, provided the applicant includes the following legend on the first page of the project narrative and specifies the pages of the application which are to be restricted:

"The data contained in pages _____ of this application have been submitted in confidence and contain trade secrets or proprietary information, and such data shall be used or disclosed only for evaluation purposes, provided that if this applicant receives an award as a result of or in connection with the submission of this application, DOE shall have the right to use or disclose the data herein to the extent provided in the award. This restriction does not limit the government's right to use or disclose data obtained without restriction from any source, including the applicant."

To protect such data, each line or paragraph on the pages containing such data must be specifically identified and marked with a legend similar to the following:

"The following contains proprietary information that (name of applicant) requests not be released to persons outside the Government, except for purposes of review and evaluation."

E. **EVALUATION AND ADMINISTRATION BY NON-FEDERAL PERSONNEL.**
In conducting the merit review evaluation, the Government may seek the advice of qualified non-Federal personnel as reviewers. The Government may also use non-Federal personnel to conduct routine, nondiscretionary administrative activities. The applicant, by submitting its application, consents to the use of non-Federal reviewers/administrators. Non-Federal reviewers must sign conflict of interest and non-disclosure agreements prior to reviewing an application. Non-Federal personnel conducting administrative activities must sign a non-disclosure agreement.

F. **INTELLECTUAL PROPERTY DEVELOPED UNDER THIS PROGRAM.**
Patent Rights.The government will have certain statutory rights in an invention that is conceived or first actually reduced to practice under a DOE award. 42 U.S.C. 5908 provides that title to such inventions vests in the United States, except where 35 U.S.C. 202 provides otherwise for nonprofit organizations or small business firms. However, the Secretary of Energy may waive all or any part of the rights of the United States subject to certain conditions. (See "Notice of Right to Request Patent Waiver" in paragraph G below.)

Rights in Technical Data. Normally, the government has unlimited rights in technical data created under a DOE agreement. Delivery or third party licensing of proprietary software or data developed solely at private expense will not normally be required except as specifically negotiated in a particular agreement to satisfy DOE's own needs or to insure the commercialization of technology developed

under a DOE agreement.

G. **NOTICE OF RIGHT TO REQUEST PATENT WAIVER.**

Applicants may request a waiver of all or any part of the rights of the United States in inventions conceived or first actually reduced to practice in performance of an agreement as a result of this announcement, in advance of or within 30 days after the effective date of the award. Even if such advance waiver is not requested or the request is denied, the recipient will have a continuing right under the award to request a waiver of the rights of the United States in identified inventions, i.e., individual inventions conceived or first actually reduced to practice in performance of the award. Any patent waiver that may be granted is subject to certain terms and conditions in 10 CFR 784.

Domestic small businesses and domestic nonprofit organizations will receive the patent rights clause at 37 CFR 401.14, i.e., the implementation of the Bayh-Dole Act. This clause permits domestic small business and domestic nonprofit organizations to retain title to subject inventions. Therefore, small businesses and nonprofit organizations do not need to request a waiver.

H. **NOTICE REGARDING ELIGIBLE/INELIGIBLE ACTIVITIES.**

Eligible activities under this program include those which describe and promote the understanding of scientific and technical aspects of specific energy technologies, but not those which encourage or support political activities such as the collection and dissemination of information related to potential, planned or pending legislation.

APPENDICES/REFERNCE MATERIAL REFERENCE MATERIAL

Appendix I - Detailed Project Objective in the Program Elements located as an attachment to this funding opportunity announcement.

Appendix II - Federal Assistance Reporting Checklist, DOE F 4600.2

Appendix III - Advanced Reactor, Fuel Cycle, and Energy Products Workshop for Universities, Questions & Answers March 20, 2007

Appendix IV - Enviromental Checklist

APPENDIX I

Detailed Project Objective in the Program Elements

Proposed projects may involve work in any activity which supports the needs of these program elements. Some examples of specific current research needs of interest to each program elements are listed below. However, proposals are encouraged beyond the listed R&D topics so long as they are relevant to the goals of the Advanced Fuel Cycle R&D Program/GNEP, the Generation IV Nuclear Energy Systems Initiative, or the Nuclear Hydrogen Initiative.

****All TRISO fuel work is located in Generation IV, Section 2.1, VHTR****

1. Advanced Fuel Cycle R&D Program/GNEP

1.1 Spent Fuel Separations Technology

The listing of some R&D needs below is organized according to programmatic activity categories.

Advanced Aqueous Separations Development

- Evaluate the chemistry of transuranic element extraction in the UREX+ suite of aqueous solvent extraction processes.
- Develop a process for the conversion of technetium strip solution from the UREX+ processes to metallic form for incorporation in a metallic waste form.
- Model and design organic extractants having acceptable radiation stability that can be used in a one-step separation of:
  - Neptunium, plutonium, americium and curium from lanthanide fission products with a decontamination factor $>10^4$.
  - Americium from curium, after lanthanide removal, with a decontamination factor $>10^4$.
- Synthesize stable advanced extractant solvent molecules with high specificity for minor actinides (Np, Am, Cm).

Pyrochemical Process Development

- Develop corrosion-resistant stable materials for use in process vessels and crucibles for containment of (1) molten salts containing actinides and fission products, (2) molten actinide metals and chloride salts, and (3) molten non-actinide metals including zirconium.
- Analyze the effects of small additions of common anions (Br^-, F^-, PO_4^{3-}, I^-) to molten chloride salts for use in electrochemical recovery of specific transuranic elements.

- Develop a durable anode material for use in electrochemical reduction of actinide oxides at temperatures of 650-750C

Waste and Product Form Development

- Measure the thermal properties of the neptunium/ plutonium/ americium/curium oxide powder storage form with and without the presence of lanthanide fission products.
- Develop durable waste forms, fabricated at low cost, for the geologic disposal of iodine and tritium.
- Develop a concept of a storage form for the UREX+1 combined transuranic/lanthanide product stream and perform an evaluation of possible inexpensive container designs for temporary repository storage of this form.
- Assess the feasibility of incorporating the fission products barium, yttrium and rubidium in the steam reforming process for the production of the cesium/strontium storage form; measure the thermal properties of a prototype waste form comprised of non-radioactive constituents.

Instrumentation Development

- Develop and demonstrate advanced on-line, near real-time analytical instrumentation for use in rapid and precise analysis of process streams, with the intention of providing a state-of-the-art system for the monitoring and control of process operations and the accounting of actinide materials for safeguards purposes.

1.2. Advanced Nuclear Fuel Development

The listing of some R&D needs below is organized according to programmatic activity categories.

Fuel design and analyses for advanced reactor concepts

Define and analyze the fuel forms needed for transmuters (with high TRU content, high helium generation, high burnup objectives). Considerations such as strategically located burnable poisons and special getter materials in or around the fuel could be included. A proposal along these lines should include thermal and structural analyses for both normal operating conditions and accident conditions.

Fuel Performance

- Design phenomenological experiments (in reactor or out of reactor with neutron sources or ion beams) aimed at fundamental understanding of fuel performance. These activities should be aimed at designing small, simple, and shorter experiments that investigate fundamental aspects of radiation damage, amorphization, fuel restructuring, species diffusion, etc. Advanced on line instrumentation and characterization techniques also are included in this category.

Fuel safety envelope assessments

- Assess the safety envelopes of advanced fuel systems by analytical means. This should include identifying the key phenomenology for establishing the safety envelope, designing specific transient tests to address the important phenomenology, and performing some of the out of pile tests.

Assessment of surrogate materials

- Determine appropriate surrogate materials for addressing different fuels phenomenology as an early way to avoid using expensive and time-consuming real materials. This should include process development using surrogate materials and correlation of the surrogate-based processes with a limited number of actual material based processes (to be supplied by the National Laboratories). This project should include the definition and quantification of how surrogate materials could be effectively employed to accelerate in-pile or out-of-pile testing of specific phenomenology.

Fabrication process development

- Devise a low-temperature or low-heat fuel fabrication processes, specifically for Am-bearing fuels. Because of the high vapor pressure of Americium at typical sintering temperatures and during typical sintering times, a considerable fraction of the Am may be lost out of the fuel pellet. Either low temperature or high-temperature short duration sintering processes that meet the density and microstructure requirements must be developed. Laboratory testing of innovative processes can be carried out using thermodynamic surrogates (e.g. dysprosium).

- Devise remote fabrication and quality assurance processes for fuels containing high quantities of TRU. Fuels containing high-quantities of transuranics require remote fabrication and characterization. Innovative design concepts that minimize the cost of fabrication minimize the waste/scrap generation and that meet the quality assurance requirements with high reliability are of considerable interest.

- Devise fuel fabrication processes and benchmark the modeling processes against known data. Process models that minimize the testing and that can be used for optimization are important for the program. The research may also include a semi-empirical set of correlations between the fabrication process parameters and fuel irradiation performance results.

Advanced mechanistic models and simulation tools

- Develop atomistic-scale to continuum scale models to replace the empirical modules in existing performance codes (e.g. FRAPCON for oxide fuels, PARFUME for TRISO fuels). Fuel development and qualification is an expensive process if one relies solely on testing and empirical knowledge. An important objective of the Advanced Fuel Cycle R&D Program/GNEP is to enhance the capabilities of the fuel performance codes by replacing some of the empirical models with more mechanistic models based on first principles. The development of such models and benchmarking against available separate

effect and integral effect data would be valuable. Models applicable to ceramic, metal and composite fuels are all within the scope of the ongoing research.

1.3 Transmutation Engineering Technologies

The listing of some R&D needs below is organized according to programmatic activity categories.

Physics

- Produce an evaluated radiation damage cross-section library for use in calculating radiation damage parameters in spallation source environments.
- Perform analysis of new nuclear data taken for actinide isotopes.
- Evaluate new material assay techniques and establish nuclear data needs.
- Perform analyses of critical safe configurations for TRU fuels and separated process streams; establish uncertainties and nuclear data needs.

Materials and Coolants for Transmutation Systems

- Evaluate austenitic (316L/D9) and ferritic/martensitic (HT-9) steels with additional silicon content. In support of advanced small reactor systems, optimize for enhancing lead-bismuth eutectic (LBE) corrosion resistance and lessening radiation damages (embrittlement).
- Investigate surface implantation/treatment with plasma, electron beam and other advanced techniques for critical components to improve compatibility and performance.
- Investigate HT-9 secondary treatment, following the Russian IPPE procedures for EP-823 (spallation target window, fuel cladding and core structures in LBE systems), to make changes in thermal mechanical properties, microstructures, surface conditions, and LBE corrosion resistance.
- Conduct advanced materials screening (refractory metals and alloys, ceramics and composites) for high performance systems (e.g. determine availability, fabrication processes, joint techniques, and thermal-mechanical properties in a non-radiation environment).
- Determine structural properties of potential structural and fuels materials as a function of radiation damage, helium production, and hydrogen production at temperatures of potential interest for advanced transmuter applications.
- Develop atomic-scale radiation damage models for extrapolating structural properties of potential structural and fuels materials.
- Develop and test new radiation damage resistant alloy formulations.

- Measure the fatigue or fatigue crack growth resistance of ferritic/martensitic alloys at prototypic temperatures of 400-600 C.

- Determine the applicability of nanostructured materials to radiation resistant applications. Determine the microstructural stability at prototypic temperatures of 400-600C.

- Determine the effect of single crystal orientation on radiation damage in BCC iron.

- Model the effects of irradiation in a high-energy proton and neutron spectrum (spallation and fast reactor conditions) on the mechanical properties of ferritic/martensitic steels at prototypic temperatures from 400-600C.

1.4 <u>Advanced Fuel Cycle Systems Analysis</u>

- The primary driver for the current repository design is long-term decay heat from Am-241. Aged spent fuel contains more Am-241 due to Pu-241 decay. An assessment of the optimal age for spent fuel recycling should include consideration of storage costs, DOT requirements, and a range of burn-up levels.

- One possible method to manage short-term repository heat load is removal of Cs and Sr from the HLW stream, diverting these fission products to separate decay storage. An assessment of waste forms, packaging, and decay storage designs for Cs and Sr for a minimum of 300 years is desired.

- Destruction of Am and potentially Cm is desired to reduce repository heat load and radiotoxicity. An assessment of fast reactor concepts for management of Am and Cm is desired, including practical target designs, associated core designs, residence time to achieve destruction, and optimal loadings to minimize the number of fast reactors needed.

- Fast reactors may be employed for both resource management and waste management. Design of flexible conversion ratio systems is of interest for time dependent management of both fissile inventories and higher actinides.

- A full closed fuel cycle would likely include removal of uranium, transuranics, and selected fission products (Cs/Sr and possibly I/Tc) from the HLW stream. The HLW with the remaining fission products would have considerably reduced volume and mass and lower decay heat per unit mass. An assessment of the degree of concentration possible is desired for different HLW forms and packaging approaches. The assessment should yield linear decay heat loads comparable to that expected using the planned repository SNF disposal packaging, while also assessing changes in waste package size and weight and shipping and shielding requirements.

- Several studies of market economics for nuclear reactors versus other energy sources have been performed in the recent past using historic fuel costs and interest rates. Recent market changes have reduced the utility of these studies. Updated studies are desired that include sensitivity analyses for a range of fuel costs, as well as consideration of impacts of current and proposed legislation.

- No large-scale remote operation nuclear facilities have been constructed in the U.S. in several years. Cost estimates for new reprocessing and remote fuel fabrication facilities can be based on historic designs. However, advances in robotics, materials, chemical separations equipment, sensors, control systems and construction practices may lower costs while regulatory changes may increase costs. An assessment of facility cost changes given current technologies, practices and regulations is desired.

- Deployment of advanced nuclear technology will depend in part on the societal understanding of nuclear energy cost/benefit/risk relative to other energy systems. Methods for comparison of dissimilar energy systems will be needed.

- Direct collaboration on existing systems codes and models is invited, both to examine new approaches and sub-models while also helping to validate existing codes and models. Systems models are used to dynamically assess the complete fuel cycle over the next century. They use existing inventory information and separately developed reactor physics calculations as inputs to determine system level material flows and transmutation impacts on waste management, non-proliferation, resource utilization and economic objectives.

1.5 Small and Medium-Sized Export Reactors

- Ultra long-lived cores, perhaps even life-time cores, are expected to improve the proliferations resistance of internationally deployed reactors. This will require R&D for both long-lived fuels and radiation-resistant core materials.

- In order to fit within the GNEP framework and reduce proliferation risks, it is desirable to use fuels that are very unattractive for weapons use, yet compatible with the fuel recycle technologies being developed in other parts of the program. This could lead to the development of new fuel types, or new dissolution/separations technologies for existing fuels such as TRISO particle fuel.

- Long maintenance cycles will require advanced sensors for in situ inspection and condition monitoring. Also highly automated or fully autonomous control systems are desirable, especially for more remote locations.

- Innovative new concepts may be needed to fully achieve all of the anticipated requirements for a reactor to be deployed to developing countries. Concepts are especially encouraged that emphasize low proliferation risk, walk-away safety, minimal infrastructure requirements, simplicity, and security.

2. Generation IV Nuclear Energy Systems Initiative

2.1 Very-High-Temperature Reactor

The listing of R&D needs below is organized according to programmatic activity categories.

Advanced Gas Reactor (AGR) Fuel Development and Qualification

Development and qualification of TRISO-coated low-enriched uranium fuel is a key R&D activity associated with the VHTR Program. The AGR Program includes work on improving the kernel fabrication, coating, and compacting technologies, irradiation and accident testing of fuel specimens, and fuel performance and fission product transport modeling. The primary goal of these activities is to successfully demonstrate that TRISO-coated fuel can be fabricated to withstand the high temperatures, burnup, and power density requirements of a prismatic block type VHTR with an acceptable failure fraction. It is assumed that TRISO fuel that is successful in a block reactor will also be successful in pebble-bed reactors since the particle packing fraction and the fuel temperatures are somewhat lower in pebble-bed reactors than in block reactors. In addition, commercialization of the fuel fabrication process, to achieve a cost-competitive fuel manufacturing capability that will reduce entry-level risks, is a secondary goal of the project.

An underlying theme for the VHTR/AGR fuel development and qualification work is the need to develop a more complete fundamental understanding of the relationship between the fuel fabrication process, key fuel properties, irradiation performance of the fuel, and release and transport of fission products in the VHTR primary coolant system. Fuel performance modeling and analysis of the fission product behavior in the primary circuit are important aspects of this work. Performance models are considered essential for several reasons, including guidance for the plant designer in establishing the core design and operating limits, and demonstrating to the licensing authority that the applicant has thorough understanding of the in-service behavior of the fuel system.

The AGR fuel development and qualification program consists of five elements: fuel manufacture, fuel and materials irradiations, post-irradiation examination and safety testing, fuel performance modeling, and fission product transport and source term modeling. Each task is discussed in some more detail below:

- ***Fuel Manufacture.*** The Fuel Manufacture task will produce coated-particle fuel that meets fuel performance specifications. This task also includes process development for kernels, coatings, and compacting; quality control (QC) methods development; scale-up analyses; and process documentation needed for technology transfer. Fuel and material samples will be fabricated for characterization, irradiation, and accident testing as necessary to meet the overall goals. Automated fuel fabrication technologies suitable for mass production of coated-particle fuel at an acceptable cost will also be developed. That work will be conducted during the later stages of the program in conjunction with a cosponsoring industrial partner.

- ***Fuels and Materials Irradiation***. The fuel and materials irradiation activities will provide data on fuel performance under irradiation as necessary to support fuel process development, to qualify fuel for normal operation conditions, and to support development and validation of fuel performance and fission product transport models and codes. It will also provide irradiated fuel and materials as necessary for post-irradiation examination and safety testing. A total of eight irradiation capsules have been defined to provide the necessary data and sample materials. The fuel irradiations will be conducted in the Advanced Test Reactor (ATR) located at the INL.

- ***Safety Testing and Post-Irradiation Examination.*** This task element will provide the equipment and processes to measure the performance of AGR fuel under accident conditions. This work will support the fuel manufacture effort by providing feedback on the accident-related performance of kernels, coatings, and compacts. Data from the post-irradiation examinations and accident testing will supplement the in-reactor measurements [primarily fission gas release-to-birth (R/B)] as necessary to demonstrate compliance with fuel performance requirements and support the development and validation of computer codes.

- ***Fuel Performance Modeling.*** The fuel performance modeling will address the structural, thermal, and chemical processes that can lead to coated-particle failures. The release of fission products from the fuel particle will also be modeled, including the effects of fission product chemical interactions with the coatings, which can lead to degradation of the coated-particle properties. Computer codes and models will be further developed and validated as necessary to support fuel fabrication process development. Results of these modeling activities will be essential to the plant designer in establishing the core design and operation limits, and demonstration to the licensing authority that the applicant has a thorough understanding of the in-service behavior of the fuel system.

- ***Fission Product Transport and Source Term Modeling***. This task will address the transport of fission products produced within the coated particles and the fuel element to provide a technical basis for source terms for AGRs under normal and accident conditions. The technical basis will be codified in design methods (computer models) validated by experimental data. This information will provide the primary source term data needed for licensing.

Proposals are particularly invited for the following two (2) research and development areas for the AGR fuel development program:

- ***AGRF-1: Evaluation of Natural Graphite Properties after Adsorption of Fission Products*.** Develop an experimental testing program, detailed evaluation plan, and data table focused on the property changes of graphite after adsorption of fission products would be beneficial in predicting the quality of a fuel compact, as well as its lifetime in a reactor. AGR fuel compacts are currently being produced using the German overcoating methodology. The overcoat is the so-called A3 matrix of natural graphite (64 wt. %), synthetic graphite (16%), and thermosetting resin binder (20%). The natural graphite contains impurities in the form of metallic inorganics that may act as active sites for adsorption of gaseous fission products like CO, CO_2, or other species. It is unknown whether the adsorption of such gases would incur structural damage to the A3 matrix, and if the rate of adsorption is related to the amount and type of impurities present. The suggested studies for the A3 matrix materials would include testing the adsorptive capabilities of the graphites for CO, CO_2, and other potential gaseous fission products, graphite property characterization with these absorbed gases, and the development of a table that shows the reactivity of a given metallic impurity toward adsorption of a given gaseous fission product. Proposals focusing on physical experiments, for fission product transport phenomena in the overcoating and compact structural graphite are sought, vs. transport through TRISO coating layers.

- ***AGRF-2: Development of an Improved Sorption Measurement Technique.*** Develop an improved sorption measurement technique to measure the accumulation of condensable radionuclides ("plateout") in the primary coolant circuits of VHTRs. Of particular concern, the expected plateout on the turbine of a direct-cycle MHR will produce significant radiation fields that will complicate plant design, operation and maintenance, and safety. It is essential that the reactor designer have the capability to reliably predict fission product transport in VHTR primary coolant circuits. To that end, design methods have been developed, and these methods have been applied extensively to support the design and safety analysis for various VHTRs. The uncertainties in such predictions are quite large (>>10x); a key reason is very large uncertainties in the material property data, especially the sorption isotherms, used as input to these design methods. The limited available sorption data for describing the deposition of condensable radionuclides on structural materials has been summarized and correlated as sorption isotherms. There are a number of generic deficiencies in these data. First, there are few data for typical turbine blade materials (e.g., IN100, Inconel 617, etc.). Moreover, with the exception of the tungsten data, these sorption measurements were made at partial pressures that are orders of magnitude higher than those predicted for the reactor during normal operation with high-quality fuel (e.g., 10^{-17} to 10^{-13} atm); consequently, the sorption isotherms derived from these data are extrapolated some four to six orders of magnitude when used in reactor analysis. Thus, an improved experimental technique needs to be developed and qualified for measuring the sorptivities of structural metals for Ag, Cs, Te and I at partial pressures, temperatures and oxidation potentials that are representative of the predicted conditions in the primary coolant circuits of VHTRs. In particular, the experimental challenge is to measure sorptivities at radionuclide partial pressures $<<10^{-10}$ atm.

Materials Research and Development

The VHTR Materials R&D Program will focus on testing and qualification of the key materials commonly used in VHTRs. The materials R&D program will address the materials needs for the VHTR reactor, intermediate heat exchanger, and associated balance of plant.

The program is being initiated before the formal design effort to ensure that appropriate data will be available to advance the VHTR design concept. The thermal, environmental, and service life conditions of the VHTR will make selection and qualification of some high-temperature materials a significant challenge; thus, new materials and approaches may be required. The following materials R&D areas are currently addressed in the R&D being performed or planned:

- ***Qualification and testing of nuclear graphite and carbon fiber/carbon matrix composites.*** Significant quantities of graphite have been used in nuclear reactors and the general effects of neutron irradiation on graphite are reasonably well understood. However, models relating structure at the micro and macro level to irradiation behavior are not well developed. Most of the past work was specific to a graphite known as H-451, which is no longer available. Therefore, the currently available nuclear grade graphite must be tested and qualified for use in the VHTR.

The graphite fuel and moderator blocks are subjected to compressive stress due to the mass of the core, and tensile and compressive stresses because of thermal gradients and irradiation-induced graphite dimensional changes. When the reactor shuts down, the stresses generally reappear in the opposite (tensile) direction and block failure may occur. An Advanced Test Reactor (ATR) creep capsule will be built in FY-07 and irradiation testing will commence in FY-08 to evaluate this phenomena.

- ***Development of improved high-temperature design methodologies.*** The High-temperature Design Methodology (HTDM) project will develop the data and simplified models required by the ASME B&PV Code subcommittees to formulate time-dependent failure criteria that will ensure adequate high-temperature metallic component life. This project will also develop the experimentally based constitutive models that will be the foundation of the inelastic design analyses specifically required by ASME B&PV Section III, Division I, Subsection NH. This effort is needed because the historic high-temperature design rules are based on separation of time and rate-independent responses or on strain-hardening idealizations, which break down at higher temperatures. Additional concerns include complex loadings and longer required lifetimes than are currently covered by existing design methods. Alloys 617, 230, and Grade-91 steel have been selected for use in the initial improved HTDM development.

- ***Expansion of American Society of Mechanical Engineers (ASME) Codes and American Society for Testing and Materials (ASTM) Standards to support the VHTR design and construction.*** Much of this effort will provide required technological support and recommendations to the Subgroup on Elevated Temperature Design (NH) as they develop methods for use of Alloy 617 at very high temperatures. ASME design code development is also required for the graphite core support structures of the VHTR and later for the structural composites to be used in the reactor internals. A project team under Section III of ASME is currently undertaking these activities. ASTM standards covering nuclear graphite specifications, as well as thermo-physical and mechanical properties of graphites and composites, are also under development.

- ***Improving understanding and models for the environmental effects and thermal aging of the metallic alloys.*** The three primary factors that will most affect the properties of the metallic structural materials from which the VHTR components will be fabricated are the effects of irradiation, high-temperature, and interactions with the gaseous environment to which they are exposed. This work is focused on assessing the property changes of the metallic alloys as a function of exposure to the high-temperature and impure gas environments expected in the VHTR.

- ***Irradiation testing and qualification of the reactor pressure vessel materials.*** Some VHTR designs assume the use of higher alloy steel than currently used for LWR pressure vessels. The irradiation damage and property changes of these materials must be measured. Therefore, an irradiation facility that can accommodate a relatively large complement of mechanical test specimens will need to be developed and installed in an appropriate material test reactor.

- ***Qualification and testing of structural composite materials needed for the VHTR.*** Some reactor internals may experience temperatures too high for commercial metallic materials and therefore require non-metallic components. Composite materials have higher strength than their base material, especially in tension; higher Weibull modulus (resulting in more uniform failure); and much higher damage tolerance (fracture toughness). This program is directed at the development of C/C and SiC/SiC composites for use in selected very high temperature/very high neutron fluence applications such as control rod cladding and guide tubes (up to 20 dpa projected lifetime dose) where metallic alloy usage may not be feasible. While SiC/SiC composites may have the potential to achieve a 60-year lifetime under these conditions, C/C composite technology is much more mature and less costly. The program will evaluate C/C materials as well as a comparison of their performance and cost with SiC/SiC composites.

- ***Assessment of fabrication and transportation issues relating to the VHTR reactor pressure vessel.*** The reactor pressure vessels for VHTR are likely to be too large to be fully fabricated in a shop and transported intact to the reactor site. Hence, materials issues associated with joining and inspecting heavy-section forgings both in the shop and in the field are covered in this task.

- ***Development of a materials handbook/database to support the Generation IV Materials Program.*** This is required to collect and document in a single source the information generated in this and previous VHTR materials R&D programs.

- ***VHTR reactor pressure vessel emissivity.*** The emissivity and other physical and mechanical properties of layers that form either by high-temperature environmental exposure or artificially engineered layers on the exterior surface of the VHTR reactor pressure vessel will be measured. These data are needed for off-normal and accident condition assessments.

We envision that university projects in the areas of graphite modeling, composite materials development and testing, VHTR component testing, and high temperature metals testing and design methodology development would be particularly valuable.

Design Methods Development and Validation

Details about the VHTR Methods research and development program are conducted in accordance with the document entitled "Next Generation Nuclear Plant – Methods Technical Program Plan," INL/EXT-06-11804. Applications are sought for the following research and development areas:

- ***CFD Code Validation Experiments.*** Additional data for CFD software validation are required to supplement the turbulent mixing data in the literature. The needed data will be applicable to the prismatic block and pebble-bed gas-reactor lower plenums available and initially collected in a large matched index of refraction (MIR) facility located at INL. Data from this effort will include finalization of an international standard problem for

release to the international community to enable development of the validation and analysis practices and procedures to be used for CFD software.

University experiments are also needed to: (1) evaluate the effects of temperature variations on turbulent mixing in the lower plenum, (2) determine turbulence quantities in heated vertical channels for evaluation of proposed CFD turbulence models, (3) evaluate the plume distribution in the upper plenum that results when the flow is density-gradient driven, for example, when the blowers are not operational, (4) evaluate the effect of "bypass" flow in both the prismatic and pebble-bed reactor geometries, and (5) model the air ingress phenomena that occur following a pipe break.. Experimental area (1) would supplement the INL MIR experiments discussed above.

- ***Validate Thermal-Hydraulic Software.*** Proposals are encouraged that will involve validation of commercial Computational Fluid Dynamics (CFD) software using literature data regarding jets in plenum with cross-flow present at operational conditions and regarding density-gradient flow from heated channels into plena. INL will also perform CFD calculations to support experiment design and further calculations will be performed to characterize heat transfer processes in the reactor cavity and reactor cavity cooling system. Improvements of RELAP5 heat transfer models, in particular to model mixed convection, are needed, and small scaled university experiments validating these models are of particular interest.

- ***Core Physics Methods Development.*** Applications are sought for the improvement of methods and software to perform validated neutronics analyses for VHTR reactor systems for generation of electricity and process heat. Specific areas of interest include cell and assembly spectrum and cross section processing methods and software as well as steady-state and transient reactor modeling methods and codes. Areas of need for specific analysis codes include: proper computation of space-dependent energy deposition profiles and decay heat profiles and trajectories especially for pebble bed reactors with recirculating fuel, development of nodal depletion theory for 3D core fuel management, treatment of streaming in the space between pebbles and in gas regions of the core, and theory and simulation of fission product transport during nominal and accident analysis (mechanistic source terms) with an emphasis on graphite dust behavior.

- ***Multiphysics, Coupled Methods Development.*** Proposals are sought for improved methods and related software to perform integrated radiation-heat-fluid transport on VHTR cores beyond traditional coupled neutronics code development. Homogenization techniques for CFD analysis of pebble beds, heat transfer and fluid flow near the pebble bed/reflector boundary, multi-scale adaptive meshing for efficient solutions to combined radiation and CFD equation systems, and Jacobian-Free Newton Krylov techniques for accuracy and speed of integrated transport simulations of VHTR transients.

- ***Reactor Physics, Kinetics Experiments Using University Reactors:*** Applications focusing on the use of an existing U.S. university reactor for relevant in-core experiments that are pertinent to VHTR phenomena and characteristics are sought. Feasibility

analyses, pre-conceptual designs, and complete research plan and description of the experiments that can be used to benchmark and validate integral nuclear data, computer modeling codes and provide detailed data for core physics evaluation methods are of particular interest. The applicability of the university reactor type for representing VHTR neutronic characteristics will need to be demonstrated in the proposal.

- ***Scaling Analysis for In/Ex Vessel Integral ANL NSTF Experiments:*** The NGNP Methods Plan calls for RCCS and potential surrogate fission product transport experiments to be performed in the ANL Natural Convection Shutdown Heat Removal Test Facility (NSTF) with the ex-vessel cavity geometry. Coupling to the in-vessel phenomena of the blow down and air ingress could leverage the benefits of the experiments. Applications are sought that would perform the thermo-fluids scaling analysis for these ANL experiments. Fission product dispersion analyses with MELCOR, SCDAP, or VANESA (or another other fission product severe accident code) would be useful, and proper selection of non-radioactive surrogates to represent fission product releases would be useful. Collaboration with ANL staff is encouraged, and can be provided.

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2.2 Sodium Fast Reactor

The SFR relies primarily on technologies already developed and demonstrated for sodium-cooled reactors and associated fuel cycles that have successfully been built and operated in worldwide fast reactor programs. As a benefit of these previous investments in SFR technology, the majority of the R&D needs that remain for the SFR are related to performance rather than viability of the system. Therefore, no technical “show-stoppers” are anticipated for SFR reactor technology. The primary issues that may inhibit SFR introduction are:

- a perception of higher capital costs, as compared to conventional LWR technology
- unique concerns related to liquid metal sodium as a coolant (in particular, coolant reactions with air/water, and component access under sodium)

Thus, the required research and development (R&D) activities focus on the items addressed above with an emphasis on improved SFR economics, in-service inspection and repair, verification of inherent safety behavior, and advanced simulations. A comprehensive international R&D program for SFR technology has been created as part of the Generation-IV International Forum. The detailed research plan includes the relevant reactor and fuels technology; some key R&D goals and products are summarized in this section. (The Generation-IV "Draft R&D Program Plan for the Sodium Fast Reactor (SFR)" revision April 2006 includes an itemized research plan and schedule for international R&D collaborations.)

For future SFR systems, it is important to achieve a level of economic competitiveness that enables system utilization in accordance with market principles. For this purpose, an important goal is to ensure competitive energy cost (per unit power generation) compared with other energy sources. To this end, a variety of innovative design features are being considered:

1. Configuration simplifications. These include reduced number of coolant loops by improving the individual loop power rating, improved containment design, refined (and potentially integrated) component design, and possibly elimination of the intermediate coolant loop. In addition, the flexibility of the core configuration must be considered for diverse fuel cycle missions (burner or breeding) and their potential impact on capital and fuel cycle costs.

2. Improved O&M technology. Innovative ideas are being considered for in-service inspection and repair. Remote handling and sensor technology for use under sodium are being developed, including ultra-sonic techniques. In addition, increased reliability for sodium-water steam generators is being pursued by advanced detection and diagnostic techniques.

3. Advanced reactor materials. The development of advanced structural materials may allow further design simplification and/or improved reliability. These new structural materials need to be qualified, and the potential for higher temperature operation evaluated.

4. Advanced energy conversion systems. The use of a supercritical CO2 Brayton cycle power generating system offers the potential for surpassing 40% efficiency; a more compact design may also be possible. Cost and safety implications must be compared to a conventional Rankine steam cycle balance-of-plant design. More detail on this issue is also given in the Energy Conversion section of this Appendix.

   With regard to reactor safety, technology gaps center around two general areas: assurance of passive safety response, and techniques for evaluation of bounding events. The advanced SFR designs exploit passive safety measures to increase reliability. The ability to measure and verify these passive features must be demonstrated. The system behavior will vary depending on system size, design features, and fuel type.

5. SFR Safety Design and Analysis. R&D for passive safety will investigate phenomena such as axial fuel expansion and radial core expansion, and design features such as self-actuated shutdown systems and passive decay heat removal systems. Associated R&D will be required to identify bounding events for specific designs and investigate the fundamental phenomena to mitigate severe accidents.

   Finally, the development and application of advanced modeling and simulation tools is a key activity in the GNEP. These tools are intended to refine the scientific modeling and improve accuracy and precision of design and performance analyses. These new techniques will also exploit modern computational hardware and software for nuclear fuel cycle applications.

6. Improved reactor simulation and design integration. The application of modern design rules and new codes may allow significant reductions of the conservative margins employed in previous fast reactor designs.

2.2 Design and Evaluation Methods Development

The listing of R&D needs below is organized according to programmatic activity categories.

This program element seeks to provide and validate analysis tools for design of Generation IV systems and confirmation of their safety. These analysis tools include modeling approaches, computer codes and databases used to represent neutronic, thermal, fluid-flow and structural phenomena in steady state and transient conditions. They also include capabilities for representing the mutual coupling among these phenomena and their coupling with additional phenomena (e.g., fuel behavior, fission gas release, materials damage, chemical reactions, etc.) for which models are created in other elements of the Generation IV, Advanced Fuel Cycle Initiative, and Nuclear Hydrogen Initiative programs. Modeling advances that are targeted reduce uncertainties in predicted system behavior and contribute to developing optimized Generation IV system designs.

To ensure the relevance of proposed modeling approaches and their cost effective implementation, the following strategy has been adopted for D&EM research:

- Establish modeling requirements for each system, working with the System Integration Manager and the GIF project management board responsible for system design development and safety confirmation,
- Assess the adequacy of existing tools and databases by examining their capabilities relative to the requirements, identifying gaps, and comparing predictions against results that are independently obtained through measurement or analysis,
- Implement required modifications to the analysis methods and define the needs for new measurements,
- Validate the models and analysis methods by confirming their ability to simulate the physical phenomena of interest with sufficient accuracy and precision.

Both initial assessment and validation of models are based substantially on comparisons with measurements. Identification of relevant measurements and determination of the need for additional measurements are thus included as an integral part of the D&EM work scope.

Some of the required analysis capabilities are crosscutting in that they are applicable to multiple Generation IV systems. Examples are Monte Carlo and deterministic transport methods for neutronics modeling, modern computational fluid dynamic (CFD) methods for heat transfer and fluid flow simulation, and modular code systems for fuel cycle evaluations and simulation of transients and postulated accidents. Advances in these capabilities will help reduce uncertainties in predicted system behavior, which can be exploited in system development by targeting the best performance achievable within the capabilities or limits of the technologies employed by the system.

A need has also been identified in the Generation IV Roadmap to advance methodologies for evaluating overall system performance against the Generation IV goals of sustainability, economics, safety, reliability, proliferation resistance, and physical protection. Compared to

methodologies previously used for such evaluations, new methodologies are needed that are more quantitative, feature an improved process for employing expert judgment, enable estimation of uncertainty in evaluated performance, better represent unique features of Generation IV systems, and account more comprehensively for important factors influencing performance. Application of these methodologies will help guide the R&D on Generation IV systems and provide a basis for judging the success of the R&D as it progresses, as well as for selection of preferred systems and system technology options.

The overall timeline for D&EM research conforms with and supports the timelines for developing the Generation IV systems. Accordingly, the first five years are devoted to providing the capabilities needed for (a) resolution of viability issues for Generation IV systems, (b) development of a high-performance VHTR design, and (c) development of sodium-cooled reactor systems in support of GNEP. Additionally, there is early emphasis on establishing the evaluation methodologies, so that they may be used for evaluating progress toward the Generation IV goals and in choosing among system technologies and design alternatives.

In the second phase of the program, the analysis methods will be increasingly focused on the specific designs adopted for the VHTR and on the development needs of other Generation IV systems. These methods will be formally qualified for use in design development and licensing. Moreover, in this second phase, the evaluation methodology efforts will increasingly be directed to evaluations of system designs and verification of performance advances.

2.3 Crosscutting Materials Development for Advanced Reactors

The listing of some R&D needs below is organized according to programmatic activity categories.

To make efficient use of program resources, the development of the required databases and methods for their application must incorporate both the extensive results from historic and ongoing programs in the United States and abroad that address related materials needs. These would include, but not be limited to, DOE, NRC, and industry programs on liquid-metal-, gas-, and light-water-cooled reactor, fossil-energy, and fusion materials research programs, as well as similar foreign efforts.

Since many of the challenges and potential solutions will be shared by more than one reactor concept, it will be necessary to work with the system integration managers (SIMs) for each individual reactor concept to examine the range of requirements for its major components to ascertain what the materials challenges and solutions to those will be and then establish an appropriate breakdown of responsibilities for the widely varying materials needs within the Generation IV Initiative. There are two primary categories for materials research needs:

- Materials needs that crosscut two or more specific reactor systems and
- Materials needs specific to one particular reactor concept or energy conversion technology.

Where there are commonly identified materials needs for more than one system, a crosscutting technology development activity has been established to address those issues. Where a specific reactor concept has unique materials challenges, it will be appropriate to address those activities in conjunction with that particular reactor systems' R&D. Examples of this category of materials needs include reactor-specific materials compatibility issues associated with a particular coolant and materials used within only one reactor concept (i.e. graphite for the Next Generation Nuclear Plant (NGNP)).

The National Materials Program within the Generation IV Initiative will establish and execute an integrated plan that addresses cross-cutting, reactor-specific, and energy-conversion materials research needs in a coordinated and prioritized manner.

Four interrelated areas of materials R&D are generally considered crosscutting: (1) qualification of materials for service within the vessel and core of the reactors that must withstand radiation-induced challenges; (2) qualification of materials for service in the balance of plant that must withstand high-temperature challenges; (3) the development of validated models for predicting long-term, physically based microstructure-property relationships for the high-temperatures, extended-operation periods, and high irradiation doses that will exist in Generation IV reactors; and (4) the development of an adequate high-temperature-materials design methodology to provide a basis for design, use, and codification of materials under combined time-independent and time-dependent loadings.

Reactor-specific materials research that has been identified for the individual reactor and energy-conversion concepts includes materials compatible with a particular coolant or heat-transfer medium, as well as materials expected to be used only within a single reactor or energy conversion system, such as graphite, selectively permeable membranes, catalysts, etc. A special category of reactor-specific materials research will also include research that must be performed at pace that would significantly precede normal cross-cutting research in the same area (e.g. NGNP reactor system materials R&D).

While materials issues for all the reactors currently included within DOE's Generation IV program, there is recognition that the plans to advance a VHTR design will strongly drive much of the materials research during the next ten years of the program. Accordingly, though the four crosscutting activities will include materials of interest to all the reactors, where possible, the emphasis will be on materials that meet the needs of the VHTR, while at the same time supporting the other reactor concepts. Where the VHTR materials needs clearly outstrip those of the other reactor systems, they will be addressed independently and the other reactor systems will be able to utilize those results that are relevant.

A final category of materials R&D that is recognized within the Generation IV Program is that which overlaps the materials needs for the development reactors for the Global Nuclear Energy Project (GNEP) and for chemical processing equipment for the Nuclear Hydrogen Initiative (NHI). While both GNEP and NHI are independent programs with their own research objectives and funding, it has already been recognized their applications will contain many of the same conditions that exist for reactor systems and their components in the Generation IV Program and, hence, may utilize a common set of structural materials. A special involvement among all three programs is being developed and maintained to help ensure that the materials R&D being

conducted within them is coordinated to minimize duplication and costs and maximize mutually beneficial materials technology development and qualification.

The high-level objectives for the Generation IV Reactor Materials Program through FY09 are:

- Complete PIE for low-dose scoping irradiations of commercial and near-commercial materials and initiate low-dose scoping irradiations of ceramics, ceramic composites, and advanced metallic materials
- Complete initial development of *Generation IV Materials Handbook*, include available historical data, and initiate additions of advanced materials data and new data developed in Generation IV Program
- Prepare interim report describing overall microstructural evolution under low and high temperature irradiation; include results from preliminary modeling studies and microstructural characterization.
- Prepare interim report on mechanisms responsible for the development of radiation-enhanced, -induced, and -modified microstructural changes.
- Prepare updated, status report on assessment and selection of crosscutting candidate materials for high-temperature and radiation service in Generation IV reactor systems.

2.4 Energy Conversion

The listing of R&D needs below is organized according to programmatic activity categories.

Supercritical CO_2 Power Conversion Cycles

- The compression stage of a supercritical CO_2 cycle involves operation near the critical point of CO_2. Examine analytical tools for CO_2 power conversion cycles and develop improved models for near critical point operation, including working fluid properties, thermodynamic analysis and turbomachinery design.
- Evaluate S-CO_2 dynamic response to startup and off normal operation. Investigate inventory or other control mechanisms for system operation. Develop innovative load-following approaches as an alternative to inventory control.
- Evaluate the use of radial turbomachinery, especially compressors, in place of axial compressors for the S- CO_2 cycle.
- Develop and test shaft seal and bearing designs for use in S-CO_2 bearing tribology tests.
- Evaluate costs and benefits of using inverters to allow non-synchronous shaft rotational speeds for S-CO_2 turbines.
- Perform steady state and transient pressure/ thermal/ combined stress analyses of turbines, compressors and other key components for supercritical CO_2 conceptual designs.

- Evaluate 2 and 3 shaft turbomachinery layouts to compare to single and multiple shaft configurations.

High-Temperature Brayton Cycle Studies.

- Develop innovative system approaches and heat exchanger designs for interstage heating and cooling for high- temperature inert gas Brayton cycles..
- Investigate single vs. multiple shaft configurations and non-synchronous shaft rotational speeds using invertors and evaluate economic and operational implications.
- Perform analyses to compare direct vs. indirect cycle approaches for high temperature reactors. Identify engineering approaches to minimize or mitigate efficiency, cost implications for indirect cycles, or mitigate operational and maintenance impacts of direct cycles.
- Investigate enabling technologies for Brayton cycles and combined cycles involving the Brayton cycle and perhaps Rankine cycles. Examine use of Brayton cycles for high temperatures and Rankine bottoming cycles at lower temperatures.

3. Nuclear Hydrogen Initiative

3.1 Thermochemical Cycles

The listing of some R&D needs below is organized according to programmatic activity categories.

Sulfur-Iodine Cycle

- Investigate alternative approaches to separation of two acids from Bunsen reaction section (H2SO4 and HI) to reduce the cycle's iodine inventory and recycle.
- Investigate alternative approaches to separation of HI from HIx (mixture of HI, I2, and H2O that is produced in the Bunsen section) as an alternative to extractive distillation using phosphoric acid that will improve overall cycle efficiency
- Investigate alternative approaches to separation of H2 from HI that may improve per pass conversion and overall process efficiency

Membranes for Sulfur Cycles

- Evaluate and/or investigate membranes that may be effective for removing water from HI, I_2, water mixtures at temperatures between 25 and 300 C.
- Evaluate and/or investigate high temperature membranes that will be effective at removing oxygen from the product stream of a high temperature sulfuric acid decomposition reactor (H_2SO_4, SO_2 and water).

- Evaluate and/or investigate methods that may be effective for the removal of water from sulfuric acid/water solutions prior to entering the sulfuric acid decomposition reactor.

Catalysts for Sulfur Cycles

- Develop catalysts that are active for the conversion of SO_3 to SO_2 and oxygen. The catalysts should have long active lifetimes and be of reasonable cost.
- Develop catalysts that are active for the conversion of HI to I_2 and hydrogen. The catalysts should have long active lifetimes.

Hybrid Sulfur

- Investigate improved or alternative materials for anodes, cathodes, and membranes materials for H_2SO_3 electrolysis.
- Investigate new approaches to minimize SO2 cross over and reduce system voltage requirements

Alternative Thermochemical Cycles

- Identify alternative thermochemical cycles (not baseline sulfur cycles) for nuclear hydrogen production that have potential for higher efficiency, lower temperature operation or are less complex, but are not presently characterized to determine viability.
- Perform flowsheet analyses to characterize process(es), in order to allow assessment of performance potential and preliminary comparison with baseline cycles.
- Identify basic thermodynamic data or laboratory experiments for alternative cycles that are needed to improve assessments.
- Enabling research in the cross cutting areas of catalysis and product separation that support one or more of the cycles of interest and addresses the major challenges of high temperature, corrosive conditions, and equilibrium limitations to conversions.

3.2 High Temperature Electrolysis

This element of the Nuclear Hydrogen Initiative focuses on developing components and overall designs for splitting steam into hydrogen and oxygen using high-temperature solid-oxide electrolyzer cells (SOECs). The technology is derived from the materials and configurations now used in solid oxide fuel cells (SOFCs). At the 750-900 °C operating temperatures of SOECs, as much as 30% of the energy for electrolysis may be supplied thermally, increasing the overall efficiency of the process to 45 - 55%. The high-temperature electrolysis (HTE) project has conducted several multiple-cell stack experiments using 10 x 10 cm planar cells to investigate the thermal and electrochemical performance of the electrolyte, electrodes and the interconnection plates. A recent test utilized a unit containing two stacks of 60 cells each. The test unit produced hydrogen at an average production rate of 850 NL/hr over a 2040-hr test. The long-duration tests are designed to identify and understand mechanisms of cell degradation due

to corrosion, creep, cell leakage, material transport and other mechanisms in high temperature operation.

In addition, the project is developing conceptual designs for the series of experiments needed to demonstrate the HTE concept on a commercial scale when attached to a 600-MWth VHTR. Besides the cells themselves, this design activity is determining requirements for components, electrical power control, steam-hydrogen separations and hydrogen and oxygen cooling. Finally, the project is investigating methods for reducing the overall costs of hydrogen production through HTE. An engineering process model has been developed to investigate the behavior of a full-scale HTE plant under various operating conditions. Flowsheet simulations have also been performed to determine the feasibility of using other types of nuclear reactors.

3.3 Reactor-Hydrogen Production Process Interface

The scope of the System Interface and Support Systems area is to ensure that all support systems and reactor interface issues and requirements are met and are ready to support the decision process as the different hydrogen generation processes mature towards the pilot and engineering scale decisions.

Work under the System Interface and Supporting Systems area is taking place in the areas of high temperature materials development and characterization, mechanical designs, balance of plant definition, steady-state and dynamic system modeling, and in system safety and environmental impacts.

Additional help from the university community through the NERI program is sought on select topics related to the intermediate heat transport loop. These topics are described below.

- Studies of corrosion chemistry, corrosion control, and system feasibility studies related to the use of $NaBF_4$-NaF, carbonate-based salts, or other liquid salts not including FLiNaK or FLiBe for use as high temperature heat transfer fluids in the intermediate heat transfer loop. Liquid salts offer the potential to increase thermal transmission efficiency in the intermediate loop because of their higher heat capacities and densities and lower pumping power requirements than gaseous heat transfer fluids. In order to be acceptable, a liquid salt must have a sufficiently low melting point (less than 500 °C), sufficiently high boiling point (above 1000 °C), and be compatible with several proposed materials of construction (e.g., high-nickel alloys, SiC). If a suitable liquid salt candidate is found from batch experiments, the project should culminate in the construction of a flow loop (natural or forced convection) to demonstrate feasibility.

- Study of the feasibility of applying thermal siphon technology (one-phase or two-phase) to the intermediate heat transport loop. Thermal siphon technology has been suggested as a means to reduce or eliminate the need for high volume pumps and/or compressors in the intermediate loop. If initial analysis work looks promising, the project should culminate in a construction and operation of a laboratory-scale demonstration of the technology that is scaleable to larger sizes (i.e., many megawatts). The fluid(s) used in the thermal siphon must be compatible with proposed materials of construction (e.g., high-nickel alloys, SiC). The thermal siphon system must be capable of delivering

thermal energy at temperatures in the range of 850-900 °C over distances that may span fifty to several hundred meters.

- High temperature (800-1000 °C) isolation valve development. Reliable and nuclear-grade certifiable isolation valves are needed to protect the high temperature nuclear reactor from failures in the high pressure helium piping or breaches in the intermediate heat exchanger(s). Such automatic safety valves may also be useful to prevent loss of fluid inventory from the intermediate heat transport loop and the communication of stored energy from the intermediate loop into the hydrogen production plant if the interface/process heat exchanger were to fail. Isolation valves are an integral component of existing commercial nuclear systems, but no standardized designs yet exist for high temperature gas-cooled reactors. Project(s) are sought in this area that would lead to designs that could be tested at the lab- and pilot-scale under expected operating conditions.

- High-temperature control valve development. A method is needed for controlling the flow split between the intermediate heat exchanger (IHX) and the energy conversion unit in a parallel arrangement of providing process heat for hydrogen production and electricity production. Research is needed on control valves to provide variation of flow.

- Comprehensive risk-based safety analyses of potential reactor and hydrogen production configurations. There is a large body of knowledge that has been applied to understanding chemical plant safety and for performing risk analyses (quantitative risk analysis, probabilistic risk analyses, etc.). The VHTR is advertised as inherently safe, but a hydrogen production plant is not inherently safe, and much remains to be done to understand how to build a combined plant that is both safe and economical. Input is encouraged from the chemical engineering communities because of their close ties with the chemical industry.

U.S. Department of Energy
FEDERAL ASSISTANCE REPORTING CHECKLIST
AND INSTRUCTIONS

1. Identification Number: DE-FG07-07IDxxxxx	2. Program/Project Title: 81.121

3. Recipient:

TBD

4. Reporting Requirements:	Frequency	No. of Copies	Addresses
A. MANAGEMENT REPORTING			
☑ Progress Report	Q F	via Email	A B C
☑ Special Status Report	A	via Email	A B C
B. SCIENTIFIC/TECHNICAL REPORTING Reports/Products must be submitted with appropriate DOE F 241. The 241 forms are available at www.osti.gov/elink.) Report/Product — Form			
☑ Final Scientific/Technical Report — DOE F 241.3	F		A, B applies to any specified OSTI reports
☑ Conference papers/proceedings* — DOE F 241.3	A		http://www.osti.gov/elink-2413
☐ Software/Manual — DOE F 241.3			http://www.osti.gov/elink-2413
☐ Other (see special instructions) — DOE F 241.3			http://www.osti.gov/estsc/241-4pre.jsp
* *Scientific and technical conferences only*			
C. FINANCIAL REPORTING			
☐ SF-269, Financial Status Report			
☑ SF-269A, Financial Status Report (Short Form)	Q F	via Email	A B C
☐ SF-272, Federal Cash Transactions Report			
D. CLOSEOUT REPORTING			
☑ Patent Certification	F	via Email	A
☑ Property Certification	F	via Email	A
☐ Other			
E. OTHER REPORTING			
☐ Annual Indirect Cost Proposal			
☐ Annual Inventory of Federally Owned Property, if any			
☐ Other			

FREQUENCY CODES AND DUE DATES:

A - Within 5 calendar days after events or as specified

F - Final; 90 calendar days after expiration or termination of the award.

Y - Yearly; 90 days after the end of the reporting period.

S - Semiannually; within 30 days after end of reporting period.

Q - Quarterly; within 30 days after end of the reporting period.

5. Special Instructions:

See page 7

Federal Assistance Reporting Instructions (5/06)

A. MANAGEMENT REPORTING

Progress Report

The Progress Report must provide a concise narrative assessment of the status of work and include the following information and any other information identified under Special Instructions on the Federal Assistance Reporting Checklist:

1. The DOE award number and name of the recipient.

2. The project title and name of the project director/principal investigator.

3. Date of report and period covered by the report.

4. A comparison of the actual accomplishments with the goals and objectives established for the period and reasons why the established goals were not met.

5. A discussion of what was accomplished under these goals during this reporting period, including major activities, significant results, major findings or conclusions, key outcomes or other achievements. This section should not contain any proprietary data or other information not subject to public release. If such information is important to reporting progress, do not include the information, but include a note in the report advising the reader to contact the Principal Investigator or the Project Director for further information.

6. Cost Status. Show approved budget by budget period and actual costs incurred. If cost sharing is required break out by DOE share, recipient share, and total costs.

7. Schedule Status. List milestones, anticipated completion dates and actual completion dates. If you submitted a project management plan with your application, you must use this plan to report schedule and budget variance. You may use your own project management system to provide this information.

8. Any changes in approach or aims and reasons for change. Remember significant changes to the objectives and scope require prior approval by the contracting officer.

9. Actual or anticipated problems or delays and actions taken or planned to resolve them.

10. Any absence or changes of key personnel or changes in consortium/teaming arrangement.

11.

A description of any product produced or technology transfer activities accomplished during this reporting period, such as:

A. Publications (list journal name, volume, issue); conference papers; or other public releases of results. Attach or send copies of public releases to the DOE Project Officer identified in Block 11 of the Notice of Financial Assistance Award.

B. Web site or other Internet sites that reflect the results of this project.

C. Networks or collaborations fostered.

D. Technologies/Techniques.

E. Inventions/Patent Applications

F. Other products, such as data or databases, physical collections, audio or video, software or netware, models, educational aid or curricula, instruments or equipment.

Special Status Report

The recipient must report the following events by e-mail as soon as possible after they occur:

1. Developments that have a significant favorable impact on the project.

2. Problems, delays, or adverse conditions which materially impair the recipient's ability to meet the objectives of the award or which may require DOE to respond to questions relating to such events from the public. The recipient must report any of the following incidents and include the anticipated impact and remedial action to be taken to correct or resolve the problem/condition:

   a. Any single fatality or injuries requiring hospitalization of five or more individuals.

   b. Any significant environmental permit violation.

   c. Any verbal or written Notice of Violation of any Environmental, Safety, and Health statutes.

   d. Any incident which causes a significant process or hazard control system failure.

   e. Any event which is anticipated to cause a significant schedule slippage or cost increase.

   f. Any damage to Government-owned equipment in excess of $50,000.

   g. Any other incident that has the potential for high visibility in the media.

B. SCIENTIFIC/TECHNICAL REPORTS

Final Scientific/Technical Report

Content. The final scientific/technical report must include the following information and any other information identified under Special Instructions on the Federal Assistance Reporting Checklist:

1. Identify the DOE award number; name of recipient; project title; name of project director/principal investigator; and consortium/teaming members.

2. Display prominently on the cover of the report any authorized distribution limitation notices, such as patentable material or protected data. Reports delivered without such notices may be deemed to have been furnished with unlimited rights, and the Government assumes no liability for the disclosure, use or reproduction of such reports.

3. Provide an executive summary, which includes a discussion of 1) how the research adds to the understanding of the area investigated; 2) the technical effectiveness and economic feasibility of the methods or techniques investigated or demonstrated; or 3) how the project is otherwise of benefit to the public. The discussion should be a minimum of one paragraph and written in terms understandable by an educated layman.

4. Provide a comparison of the actual accomplishments with the goals and objectives of the project.

5. Summarize project activities for the entire period of funding, including original hypotheses, approaches used, problems encountered and departure from planned methodology, and an assessment of their impact on the project results. Include, if applicable, facts, figures, analyses, and assumptions used during the life of the project to support the conclusions.

6. Identify products developed under the award and technology transfer activities, such as:

   a. Publications (list journal name, volume, issue), conference papers, or other public releases of results. If not provided previously, attach or send copies of any public releases to the DOE Project Officer identified in Block 11 of the Notice of Financial Assistance Award;

   b. Web site or other Internet sites that reflect the results of this project;

   c. Networks or collaborations fostered;

   d. Technologies/Techniques;

   e. Inventions/Patent Applications, licensing agreements; and

   f. Other products, such as data or databases, physical collections, audio or video, software or netware, models, educational aid or curricula, instruments or equipment.

7. For projects involving computer modeling, provide the following information with the final report:

   a. Model description, key assumptions, version, source and intended use;

   b. Performance criteria for the model related to the intended use;

   c. Test results to demonstrate the model performance criteria were met (e.g., code verification/validation, sensitivity analyses, history matching with lab or field data, as appropriate);

   d. Theory behind the model, expressed in non-mathematical terms;

   e. Mathematics to be used, including formulas and calculation methods;

f. Whether or not the theory and mathematical algorithms were peer reviewed, and, if so, include a summary of theoretical strengths and weaknesses;

g. Hardware requirements; and

h. Documentation (e.g., users guide, model code).

Electronic Submission. The final scientific/technical report must be submitted electronically via the DOE Energy Link System (E-Link) accessed at http://www.osti.gov/elink-2413.

Electronic Format. Reports must be submitted in the ADOBE PORTABLE DOCUMENT FORMAT (PDF) and be one integrated PDF file that contains all text, tables, diagrams, photographs, schematic, graphs, and charts. Materials, such as prints, videos, and books, that are essential to the report but cannot be submitted electronically, should be sent to the Contracting Officer at the address listed in Block 12 of the Notice of Financial Assistance Award.

Submittal Form. The report must be accompanied by a completed electronic version of DOE Form 241.3, "U.S. Department of Energy (DOE), Announcement of Scientific and Technical Information (STI)." You can complete, upload, and submit the DOE F.241.3 online via E-Link. You are encouraged not to submit patentable material or protected data in these reports, but if there is such material or data in the report, you must: (1) clearly identify patentable or protected data on each page of the report; (2) identify such material on the cover of the report; and (3) mark the appropriate block in Section K of the DOE F 241.3. Reports must not contain any limited rights data (proprietary data), classified information, information subject to export control classification, or other information not subject to release. Protected data is specific technical data, first produced in the performance of the award that is protected from public release for a period of time by the terms of the award agreement.

Conference Papers/Proceedings

Content: The recipient must submit a copy of any conference papers/proceedings, with the following information: (1) Name of conference; (2) Location of conference; (3) Date of conference; and (4) Conference sponsor.

Electronic Submission. Scientific/technical conference paper/proceedings must be submitted electronically via the DOE Energy Link System (E-Link) at http://www.osti.gov/elink-2413. Non-scientific/technical conference papers/proceedings must be sent to the URL listed on the Reporting Checklist.

Electronic Format. Conference papers/proceedings must be submitted in the ADOBE PORTABLE DOCUMENT FORMAT (PDF) and be one integrated PDF file that contains all text, tables, diagrams, photographs, schematic, graphs, and charts. If the proceedings cannot be submitted electronically, they should be sent to the DOE Administrator at the address listed in Block 12 of the Notice of Financial Assistance Award.

Submittal Form. Scientific/technical conference papers/proceedings must be accompanied by a completed DOE Form 241.3. The form and instructions are available on E-Link at http://www.osti.gov/elink-2413. This form is not required for non-scientific or non-technical conference papers or proceedings.

Software/Manual

Content. Unless otherwise specified in the award, the following must be delivered: source code, the executable object code and the minimum support documentation needed by a competent user to understand and use the software and to be able to modify the software in subsequent development efforts.

Electronic Submission. Submissions may be submitted electronically via the DOE Energy Link System (E-Link) at http://www.osti.gov/estsc/241-4pre.jsp. They may also be submitted via regular mail to:

Energy Science and Technology Software Center
P.O. Box 1020
Oak Ridge, TN 37831

Submittal Form. Each software deliverable and its manual must be accompanied by a completed DOE Form 241.4 "Announcement of U.S. Department of Energy Computer Software." The form and instructions are available on E-Link at http://www.osti.gov/estsc/241-4pre.jsp.

C. FINANCIAL REPORTING

Recipients must complete the financial reports identified on the Reporting Checklist in accordance with the report instructions. These standard forms are available at http://www.whitehouse.gov/omb/grants/index.html. Fillable forms are available at http://grants.pr.doe.gov.

D. CLOSEOUT REPORTS

Final Invention and Patent Report

The recipient must provide a DOE Form 2050.11, "PATENT CERTIFICATION." This form is available at http://www.directives.doe.gov/pdfs/forms/2050-11.pdf and http://grants.pr.doe.gov.

Property Certification

The recipient must provide the Property Certification, including the required inventories of non-exempt property, located at http://grants.pr.doe.gov.

E. OTHER REPORTING

Annual Indirect Cost Proposal and Reconciliation

Requirement. In accordance with the applicable cost principles, the recipient must submit an annual indirect cost proposal, reconciled to its financial statements, within six months after the close of the fiscal year, unless the award is based on a predetermined or fixed indirect rate(s), or a fixed amount for indirect or facilities and administration (F&A) costs.

Cognizant Agency. The recipient must submit its annual indirect cost proposal directly to the cognizant agency for negotiating and approving indirect costs. If the DOE awarding office is the cognizant agency, submit the annual indirect cost proposal to the DOE Award Administrator identified in Block 12 of the Notice of Financial Assistance Award.

Annual Inventory of Federally Owned Property

Requirement. If at any time during the award the recipient is provided Government-furnished property or acquires property with project funds and the award specifies that the property vests in the Federal Government (i.e. federally owned property), the recipient must submit an annual inventory of this property to the DOE Award Administrator identified in Block 12 of the Notice of Financial Assistance Award no later than October 30th of each calendar year, to cover an annual reporting period ending on the preceding September 30th.

Content of Inventory. The inventory must include a description of the property, tag number, acquisition date, location of property, and acquisition cost, if purchased with project funds. The report must list all federally owned property, including property located at subcontractor's facilities or other locations.

F. SPECIAL INSTRUCTIONS

Your performance in providing on-time report deliverables will be monitored by Procurement Services Division (PSD), Idaho Operations Office, Department of Energy. Reports not received by the specified due date are late. Overdue, inaccurate, or non-conforming reports are not acceptable. PSD will withhold payments or take other administrative actions as needed for non-compliance with reporting requirements (see 10 CFR 600.24). Only the Contracting Officer may waive or excuse required reports.

In order for accurate logging and processing of reports, it is critical that reports be sent to all the specified addressees and in the manner requested. PSD receives a copy of all reports via psdrept@id.doe.gov. The message subject line must include the award number.

Message Subject Line Example: DE-FC07-07ID99999, 4Q SF 269A Report.

The official award number must also be identified on all reports. A project number, if assigned by the program manager, may also be included, but is not a substitute for the official award number.

Report forms and additional report submittal guidance may be found on PSD's Internet web site at http://www.id.doe.gov/doeid/psd/proc-div.html. General guidance, in a question and answer format, is listed under "FA Report Submittal Guidance."

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REPORT ADDRESSEES

A. Procurement Services Divsion (PSD): psdrept@id.doe.gov
B. DOE Project Manager: TBD
C. DOE Headquarters' Program Manager: TBD
cc: Headquarters' Technical Monitor: TBD

(End of Part IV)

The following are questions posed by interested parties, and answers provided by the DOE during the *ADVANCED REACTOR, FUEL CYCLE, AND ENERGY PRODUCTS WORKSHOP FOR UNIVERSITIES* held on March 20, 2007 at Hilton Hotel, Gaithersburg, MD

NOTE: SINCE THE WORKSHOP, CERTAIN CHANGES HAVE BEEN MADE TO THE NERI-C PROGRAM; THOSE CHANGES ARE REFLECTED IN THIS DOCUMENT.

1. QUESTION: Clarify the 20% matching- is it $2.5 million per year?

   ANSWER: Cost Share is not required.

2. QUESTION: Are consortia arranged through team lead?

   ANSWER: Yes. The team lead must submit the proposal for the entire team.

3. QUESTION: Are you going to limit university rates to 10%?

   ANSWER: No, university rates will be applied per their approved rate agreements.

4. QUESTION: Can you expand upon second award criteria on investigator and fellowships?

   ANSWER: Principle Investigator and use of graduate students (10%). The proposal should clearly state the capabilities and qualifications of the principal investigator(s)/project manager(s) and key personnel by consortia member. The proposal should explain the relationship between the principal investigator(s)/project manager(s) and students and how the prospective graduate students' academic credentials fit in the applicable scope. This portion of the proposal should also address the commitment to the students.

5. QUESTION: Logistics – one proposal, submit by lead? Do others submit input to the lead?

   ANSWER: All collaborators submit to the prime. If one partner will not submit via the lead, need to contact DOE. Contact: Beth Dahl, dahlee@id.doe.gov

6. QUESTION: Do graduate students have to be named or identified?

   ANSWER: No. The DOE is interested in how their academic credentials fit in the applicable scope.

7. QUESTION: Does the lead partner submit the proposal?

ANSWER: Yes

8. QUESTION: Do you anticipate that the consortium award will be made in disciplinary areas- reactor physics, safety, etc.?

ANSWER: A balanced portfolio can cover more than one discipline.

9. QUESTION: How are we supposed to specify collaboration with the national laboratories?

ANSWER: They need to be discussed in the proposal narrative; they need to submit work package documentation; and they need to submit the contracting officer's authorization letter (for their laboratory). Include the laboratory in the budget submittal using the work package documentation and just list them on a separate line item of the appropriate prime or subawardee budget. The DOE will fund the Federal laboratory directly.

10. QUESTION: When looking at the three areas, can the proposals be chosen in more than one area?

ANSWER: Proposals will be reviewed using the merit review criteria and the other selection factors.

11. QUESTION: Benefits of consortia- divide dollars many ways? If you have 4 consortia, 4 universities, each gets 200,000 within this, are we supposed to support students, faculty, outreach, and matching grants? Can you justify the purchase of equipment that is not related to GNEP or GEN IV?

ANSWER: You do not need to cover all aspects of the program areas' other selection factors in the FOA, but what is included should reflect the DOE mission.

12. QUESTION: Is there potential to increase awards next year?

ANSWER: No. DOE intends to fund the budgets as negotiated, subject to availability of funds.

13. QUESTION: The only thing being discussed is $10 million dollars. Where should I focus my time today? What is the distribution of the $10 million dollars?

ANSWER: Of the $10M, $8M are in GNEP with the remainder from NHI and Generation IV.

14. QUESTION: Are there individual awards from this announcement?

ANSWER: No - all awards will be to consortia. DOE cannot manage consortia agreements (consortia must manage their own). Next year, FY 2008, the NERI

program will issue two announcements: one in the consortia, and one in the individual principal investigator area.

15. QUESTION: Can you talk about the $100,000 awards? Can you elaborate?

ANSWER: GNEP has $4M to prepare NE schools. These will be one-time awards, to prepare for future GNEP R&D. See Funding Opportunity Announcement number DE-PS07-07ID14817.

16. QUESTION: What is happening to the existing programs, e.g., diversity, reactor sharing, etc.?

ANSWER: They have been merged into the NERI program.

17. QUESTION: Are the programs to be embedded? (Reactor sharing, Matching, and Infrastructure)

ANSWER: They have been merged into the NERI program...

18. QUESTION: Since the money is small, can one professor work with more than one consortium?

ANSWER: Yes.

19. QUESTION: Are we fixed with the consortia budget for the following year, in other words, if you get an award this year, can you increase the budget for next year, considering there is more money?

ANSWER: No. You will need to apply when the FY 2008 funding announcements are released.

20. QUESTION: For this year, will there be any more individual NERI awards?

ANSWER: No, the awards are complete.

21. QUESTION: Will traditional NE fellowship funding continue?

ANSWER: No further funding is anticipated. Existing fellowships have been fully funded.

22. QUESTION: For the graduate students, the implication was that you wanted them identified. Do you want this identification in terms of names, or listed in a format like "two masters students, one PhD."

ANSWER: Identify the prospective graduate students' academic credentials and how it fits in the applicable scope.

23. QUESTION: Are we limited to having only one award at a time?

ANSWER: You may have multiple awards.

ID-EC98.1

APPLICANT ENVIRONMENTAL CHECKLIST

The following information must be provided to and approved by the Department of Energy (DOE) before a contractual document can be awarded. Complete and correct information expedites the review process.

SECTION A:

Project Title: _____

Applicant Organization: _____

Applicant Organization Contact (usually the PI): _____

Telephone Number and Email Address _____

SECTION B: Attach a complete and concise description of the project or activity. Include purpose and need and enough information so that a verification of the impacts can be performed. This allows DOE to make the proper NEPA determination.

SECTION C: SOURCES OF IMPACTS: WOULD THE PROPOSAL INVOLVE OR GENERATE ANY OF THE FOLLOWING? (If yes, please provide brief explanation. For example, if yes is checked for question 15, indicate how much waste will be generated and the office or procedure in place to handle disposal.)

	YES	NO		YES	NO
1. Air Emissions			10. Contaminated Soil		
2. Asbestos Emissions or Waste			11. Industrial Waste Generation		
3. Biological Hazards			12. PCBs		
4. Discharge of Wastewater			13. Hazardous Waste Generation		
5. Cultural/Historical Resources			14. Radioactive Waste Generation		
6. Soil Disturbance			15. Mixed Waste Generation		
7. Radioactive Material Use			16. Chemical Waste Disposal		
8. Water/Well Use			17. Interaction with Wildlife/Habitat		
9. Work Within a Floodplain			18. Chemical Use/Storage		

SECTION D: CATEGORY EVALUATION CRITERIA, WOULD THE ACTION:

	YES	NO
1. Require cultural, historical, or biological clearances?		
2. Impact sensitive resources identified in Item 1 above? Describe the mitigation plan.		
3. Require or modify federal, state, or local permits, approvals, etc.?		
4. Create hazardous, radioactive, PCB, or mixed waste for which no disposal is available?		
5. Require siting, construction, or modification of a RCRA or TSCA regulated facility?		
6. Is the activity included in an Environmental Impact Statement or Environmental Assessment?		

SECTION E: CERTIFICATION. To the best of the applicant' s knowledge at the time of signing, the responses given above are complete and accurate, and should new issues or concerns arise or changes occur anytime after award and during the course of performance, the applicant will alert DOE immediately.

_____ _____

APPLICANT SIGNATURE & TITLE DATE

FOR DOE USE ONLY	
NEPA Doc Number:	**Solicitation #:**
NEPA CX Applied:	**Contract Specialist:**
Approved: Signature/Date:	**Project Manager:**